Health Canada Santé Canada

Evaluation Group

Strategic Planning and Review Directorate

Policy and Consultation Branch

Groupe de l'évaluation

Direction de la planification stratégique et de l'examen

Direction générale des politiques et de la consultation

TECHNICAL REPORT # 6: WORKING DOCUMENTS ENVIRONMENTAL HAZARDS PROGRAM EVALUATION

June 1995

Canada

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104-00507/

TECHNICAL REPORT # 6: WORKING DOCUMENTS EVALUATION OF THE ENVIRONMENTAL HAZARDS PROGRAM

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Credits

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WORKING DOCUMENT A: COMPARISON OF SELECTED PROJECT AREA REVIEWS OF THE BUREAUX OF CHEMICAL HAZARDS AND RADIATION PROTECTION

This comparison gives a background information of the Environmental Health Directorate program area reviews (PARs), discusses the process involved in selecting a project area and its review, focuses in PARs from the Bureau of Radiation Protection (RPB) and the Bureau of Chemical Hazards (BCH), selects and compares PARs from both Bureaux, and discusses their major similarities and differences.

1 BACKGROUND

The Bureaux of the Environmental Health Directorate plan and conduct their work in project areas. The Bureaux operate a matrix project system in which resources from more than one Division within the Bureaux can be applied to individual project areas. This ensures that expertise or knowledge in one Division can be readily made available to a project which is being led from another Division.

As part of their risk assessment and risk management activities, the Bureaux conduct annual reviews of their project areas. Included in these reviews are the achievements towards goals per fiscal year, progress to date of the current fiscal year, and a list of publications and information about other types of outputs. Goals and resources are also proposed for the upcoming fiscal year. The process is ongoing and has been in place for the last fifteen years. Presently, the process includes mainly four steps:

1.1. A Proposed Activity Evaluation and Priorization Framework. Part of the field work for the PAR consisted of a framework document which was based on the work done during at the Chaffey's Lock management meeting in 1991. The framework delineates alternative risk assessment and risk management activities and strategies for Non-ionizing Radiation Emitting Devices Section. While PARs from RPB are based in this framework, it is not clear if the same applies to PARs from BCH.

1.2. A Profile. As part of Health Protection Branch Review process, some nineteen questions and corresponding sub-questions (see Appendix A.1) were developed to produce the Responsibility

Centre Profile. The profile serves as a detailed background document for the PAR report. It identifies the goals, the mandate and priority criteria used for the particular project area, collaborators, planning and allocation of resources, etc.. The date and frequency required for the profile is not documented. The document appears to be a RPB initiative and a one-tine activity;

1.3. Call for proposals. Areas for projects are requested in November/December. Presently, the Directorate does not have a formal mechanism to call for project proposals; and

1.4. Project Areas Review Reports. This step involves the project review presentations, project approval and project implementation. The reports are prepared annually towards the end of the Fiscal Year (February/March) and are described below.

The Directorate's Project Area Review (PAR) report format includes:

a). **Introduction.** This section entails the project number and area under review, the name of the Bureau, the names of project coordinators and collaborators and a description of the project area;

b). **Logic Chart.** A Logic Chart showing the mission, the how of the risk assessment and risk management activities, the objectives and targets of the project area was introduced in 1994. This appears to be a BCH initiative, RPB PARs do not show any logic charts.

c) **Long-term Objectives**. This section includes the long-term objectives of the project area under review;

d) **Resource allocation.** This section contains person years and expenditures per fiscal year;

e) **Major Goals & Five-Year Resource Plan**. This section details major goals, a time frame and a five year plan of person years and expenditures per each major goal;

f) **Achievements**. This section includes the achievements and status of each approved goal per fiscal year;

g) **Progress Report.** This section provides a progress report and status of each approved goal for the current fiscal year;

h) **Proposed Goals.** This section describes the new goals for the upcoming fiscal year. Goals are classified as mandated under legislation, continuing goals or final stage goals;

i) **Communication Plan**. This section contains the methods to be used to communicate the information developed during the project for the upcoming fiscal year;

j) **Measurable Outputs.** This section provides a list of measurable outputs produced under the project area per major goal and for each fiscal year;

k) **Documents/Publications**. This section lists the documents/publications produced under during the project; and

l) **Major Problem Areas**. This section identifies major problem areas that were not included in the project. The problem area impacts and estimated person year allocation and expenditures are also provided in this section of the report.

The Bureaux project areas are selected because of legislative mandate, policy decisions, demands by clients, or a priority crisis. The PAR reports do not indicate why a project was selected. Two of the steps (the framework and profile) in the process appear to be a one-time-only exercise. PAR reports do not provide a follow-up/feedback section for problems encountered or changes of policy/management decisions.

Currently the Directorate is undergoing a number of strategic planning exercises to develop a more dynamic and structured planning system. A draft report on this system was made available to the Program Evaluation Division, and it was also indicated by officials in the Directorate that a special committee is looking into the planning activities of the Directorate to be link to those of the Branch and the Department. Figure A.1 shows some of these new planning ideas, which include an ongoing six step process tied to the Department's mission and objectives. These new ideas are still in draft format.

Figure 1. PROJECT AREA REVIEW PROCESS -- THE PLANNING CYCLE

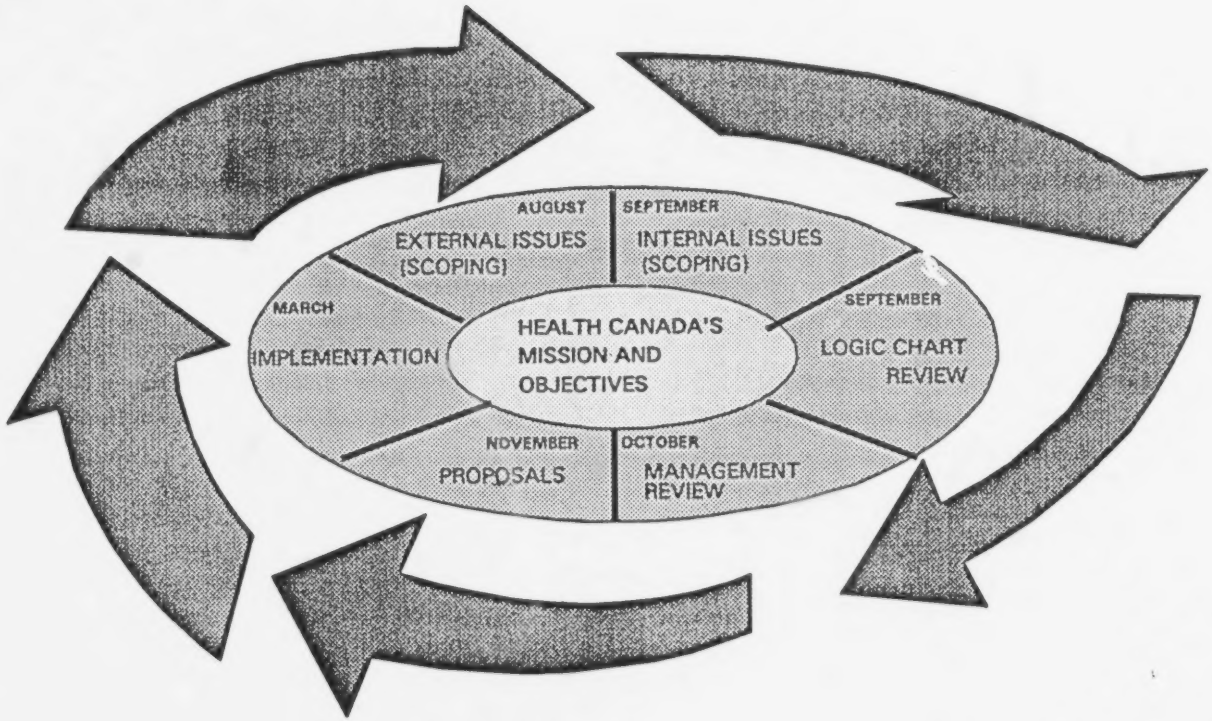
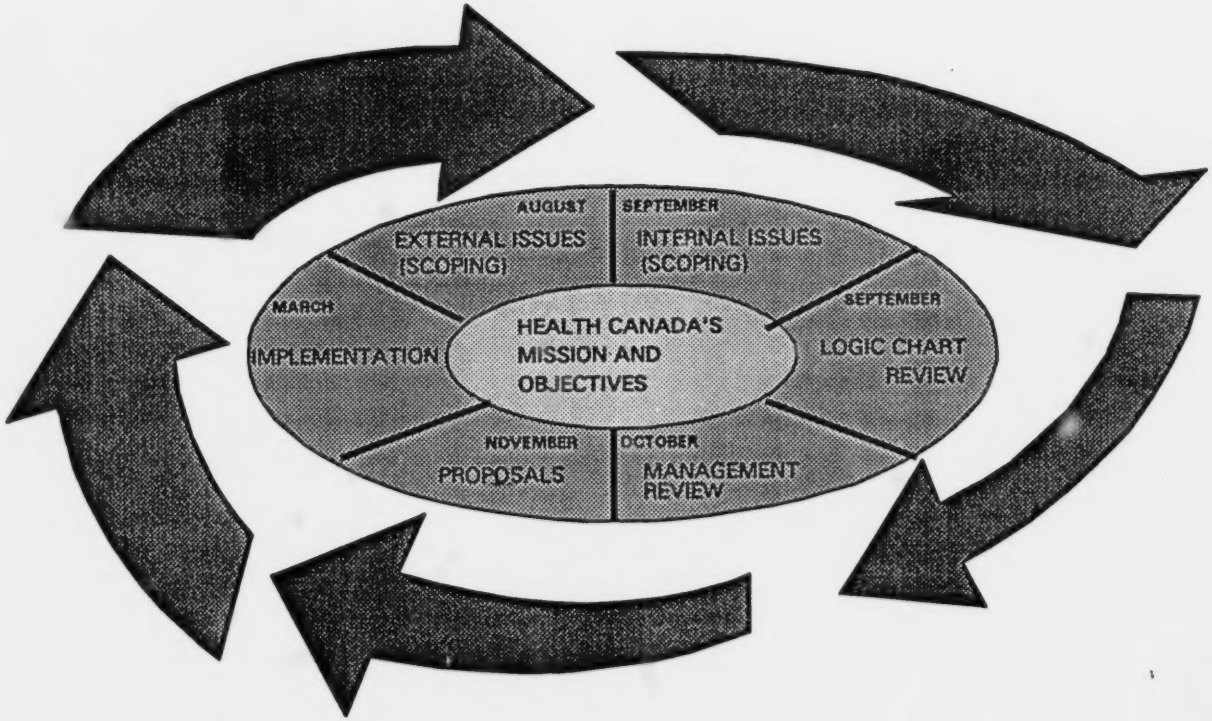


Figure 1. PROJECT AREA REVIEW PROCESS -- THE PLANNING CYCLE



2. REORGANIZATION

During fiscal year 1993/94, the Directorate went through major reorganizations affecting both RPB and BCH.

The Bureau of Radiation Protection and Medical Devices was split into two Bureaux: Radiation Protection and Medical Devices. All project areas pertaining to Medical Devices were transferred to this newly formed Bureau. In fiscal year 1994/95, RPB retained six of the former ten project areas and introduced a new project area in National Calibration Reference Centre for Bioassay and in-vivo Monitoring, totalling seven project areas (see Table A.2, below).

The Bureau of Chemical Hazards lost four of its nine project areas: the Chemical Consumer Products and Tobacco projects were transferred to the Product Safety Bureau and the Pesticides project was transferred to the Foods Directorate. Hazardous Waste was sunsetted at the end of the Fiscal year (March 1994). BCH renamed three of its project areas: Industrial and Commercial Chemicals (PR-32) was renamed New Chemical Substances and Biotechnology Products; Priority Substances (PR-33) was renamed Environmental Contaminants; and Great Lakes Health Effects (PR-34) was renamed Bioregional Health Effects Program. The Bureau also introduced a new Bureau Goals (PR-00) project. In 1994/95, BCH project areas total six. Table A.2, below shows PARs for both Bureaux for fiscal years 1993/94 and 1994/95 respectively.

Table A.2 Project Area Reviews (PARs)

Bureau of Radiation Protection		Bureau of Chemical Hazards	
1993/94	1994/95	1993/94	1994/95
PR-01, Environmental Radioactivity	PR-01, Environmental Radioactivity	PR-21, Chemical Consumer Products	PR-00, Bureau Goals
PR-03, X-Rays	PR-03, X-Rays	PR-22, Drinking Water Quality	PR-22, Drinking Water Quality
PR-04, Non-Ionizing Radiation	PR-04, Non-Ionizing Radiation	PR-27, Pesticides	MOVED
PR-05, Radiation Dosimetry and Occupational Monitoring	PR-05, Radiation Dosimetry and Occupational Monitoring	PR-28, Air Quality	PR-28, Air Quality
PR-06, Radiopharmaceuticals	PR-06, Radiopharmaceuticals	PR-30, Tobacco	MOVED
PR-08, Occupational Radiation Exposure Evaluation	PR-08, Occupational Radiation Exposure Evaluation	PR-32, Industrial and Commercial Chemicals	PR-32, New Chemical and Biotechnology Products
PR-47, Implantable Medical Devices	PR-09, National Calibration Reference Centre for Bioassay and IN-VIVO Monitoring	PR-33, Priority Substances	PR-33, Environmental Contaminants
PR-48, Electroradiative and Short Term Implanted Medical Devices		PR-34, Great Lakes Effects	PR-34, Bioregional Health Effects Program
PR-49, Mechanical Medical Devices		PR-35, Hazardous Waste	MOVED
PR-50, Home Use Medical Devices			

3. COMPARISON

Six project area reviews were selected for comparison. Two reviews were selected from RPB and four from BCH. The selection of RPB reviews was based on their relation with the Radiation Emitting Devices (RED) Act. Similarly, the selection of BCH reviews was based on their relation to the Canadian Environmental Protection Act (CEPA). Table A.3 shows the areas of the projects selected and Table A.2.1, in Appendix A.3, compare the selected project area reviews against each of the Directorate's report format components.

Table A.3 Selected PARs from RPB and BCH

Bureau of Radiation Protection	Bureau of Chemical Hazards
1. PR-03, X-Rays	1. Air Quality
2. PR-04, Non-Ionizing Radiation	2. PR-32, New Chemical and Biotechnology Products
	3. PR-33, Environmental Contaminants
	4. PR-34, Bioregional Health Effects Program

4. SIMILARITIES AND DIFFERENCES

Few similarities and difference were found among PARs from both Bureaux. Table 4, shows the major similarities and differences found among the five project areas selected.

Table A.4 Similarities and Differences

Similarities	Differences
- all PARs selected coordinate risk assessment and risk management activities associated with their project area; - PARs goals from both Bureaux are targeted to meet the objectives associated to the Risk Assessment and Risk Management activities of the Risk Determination model: - For example, in the case of PR-32. Goal 3210, to develop tests and procedures for estimating toxicity of new Industrial Chemicals notified under CEPA is designed to identify the hazards associated with new chemical substances (Risk Assessment activity).	- BCH's PAR reports include a logic chart which includes the mission, the how of risk assessment and risk management activities of the project, objectives and targets. RPB PAR reports do not include this chart. - RPB projects are link to the RED Act, which is administered by Health Canada. Enforcement of the Act is the responsibility of Health Canada. BCH projects are link to the CEPA, which is jointly administered by Environment Canada and Health Canada. Enforcement of the Act is mainly the responsibility of Environment Canada.
- all PARS follow the Directorate's PAR report format.	- resource allocation per project area vary from project to project.
- most PARs goals are achieved.	- RPB projects include regulations, safety codes, assessment of devices, regulatory submissions, etc. as their measurable outputs. BCH projects do not include regulatory action.
- most PARs communication plans include publications, information strategies,	- only RPB reviews identified major problem areas for which no activities were proposed.
- most PARs measurable outputs include publications, reports, public enquiries, etc.	- the scope of PR-34 goal and activities seems wider than the other PARs selected, its activities involve not only other Divisions in the Bureau but also other Bureau and Departments.
- all PARs selected include abstracts, proceedings, reports, etc. as their documents/publications.	

APPENDIX A.1 - HEALTH PROTECTION BRANCH PROGRAM REVIEW: RESPONSIBILITY CENTRE PROFILE QUESTIONS

TABLE A.1.1 HEALTH PROTECTION BRANCH PROGRAM REVIEW: RESPONSIBILITY CENTRE PROFILE QUESTIONS
1. What do you do? 1.1 What are your fiscal year goals? 1.2 What major result area is being addressed? 1.3 For which project area(s) are you responsible? 1.4 Is this responsibility shared with another responsibility centre?
2. Why are you doing what you do? 2.1 What mandate/legal authority exists for the work of the responsibility centre? 2.3 Who has the ultimate jurisdiction/responsibility with respect to the work? 2.4 What are the sources of demand for the results of your work (e.G. Clients, other stakeholders, legislation or policy decision) ? 2.5 What criteria do you use to set priorities for projects?
3. With whom do you collaborate: Internally? Externally?
4. How do you do what you do? (e.g. inspection, laboratory analysis, surveillance, data collection, or other (specified) mechanisms)
5. How much do you do? 5.1 Quantitative outputs (e.g. submissions reviewed, inspections, evaluations, research projects, studies, guidelines, cases, etc.) 5.2 Qualitative outputs (e.g. Advice, collaboration, information/education, etc.)
6. Who else does similar work in Canada? In other countries? (including the United States of America, United Kingdom, France, Germany, Sweden, New Zealand and Australia) 6.1 What lessons could we learn from other countries or international organizations like OECD, WHO, etc.?
7. How else could the work be done? 7.1 Can the role of the federal government be reduced? Are there opportunities to acquire current outputs elsewhere (e.g. contracting, purchase, transfer of responsibility, delegation)? Please identify any legislative changes that would be required to do so.
8. Why should (a) the department and (b) your responsibility centre be doing the work?

TABLE A.1.1 HEALTH PROTECTION BRANCH PROGRAM REVIEW: RESPONSIBILITY CENTRE PROFILE QUESTIONS
9. What would happen if you stopped doing the work?
10. Are you doing the work as well as you would like? 10.1 Are any opportunities to improve efficiency or effectiveness being missed in the current work of the responsibility centre? Why? 10.2 What would you like to do better? 10.3 What is stopping you from doing it better? 10.4 What have you done better over the past five years? 10.5 What do you do best?
11. How do you measure your success in terms of performance and service? 11.1 Has this changed over the past five years? How? 11.2 Do you have service standards? When were they established/ when last updated? (If there are none, please explain why and whether there should be some)
12. What will happen when the cuts are applied over the next few years (3% in 1994/95, 2% in 1995/96, and 2% in 1996-97)?
13. Are these opportunities to recover costs or to generate revenues?
14. Can you increase the impact of your work through information management or other technologies? By other means?
15. Who are your clients and stakeholders? 15.1 How do they depend on your work? 15.2 How do they influence what you do? 15.3 Are they satisfied? How do you know?
16. Has anyone audited/evaluated what you have done? (E.G. Operational Audits, Program Evaluations, Parliamentary reports, other specially commissioned studies, public/client/stakeholder opinion survey results over the past five years)
17. What are the current pressures and influences affecting your responsibility centre's performance? 17.1 Policy influences 17.2 Fiscal influences 17.3 Program configuration issues : (include regionalization, shared mandate, overlap, etc.) 17.4 Pressures from clients and stakeholders 17.5 Any other influences 17.6 In the past five years how have these pressures changed (e.g. grown, decreased or remained static)?

TABLE A.1.1 HEALTH PROTECTION BRANCH PROGRAM REVIEW: RESPONSIBILITY CENTRE PROFILE QUESTIONS	
18.	What pressures are expected over the next five years? What is the risk of not addressing them?
19.	Are there any gaps in the work of your responsibility centre could be creating a liability for the government?

APPENDIX A.2 - PROJECT AREA REVIEW COMPARISON

Table A.2.1 PAR Comparison

a). Introduction (Project Description)

Bureau of Radiation Protection

1. PR-03, X-Rays

- coordinates risk assessment and risk management activities associated with the use of medical and industrial x-ray and electron beam devices;
- the x-ray activity operates under the RED Act, the Food and Drugs Act, Treasury Board Standards, and the MOU with Labour Canada (Canada Labour Code);
- activities include preparing and disseminating information on radiation safety, including safety codes, guidelines and classroom lectures and workshops; providing radiation training and surveillance to federal X-ray equipment users; giving advice on radiation safety matters to this and other Departments, the general public, health care professionals and X-ray equipment and manufacturers users; representing the Department on national and international radiation protection organizations; participating in the development of consensus safety standards at the national and international level, including the harmonization of the Canadian requirements with those of other national and international bodies; conducting investigations and research on all aspects of X-radiation safety; and providing expertise on radiation, electrical and mechanical safety of X-ray emitting devices.

2. PR-04, Non-Ionizing Radiation

- coordinates risk assessment and risk management activities associated with devices which emit non-ionization radiation or produce electromagnetic fields, e.g. laser emissions, radiofrequency fields, power line fields, noise, ultrasound, infrared light and ultraviolet;
- the non-ionization activity operates under the RED Act and Regulations, the Medical Devices Regulation of the Food and Drugs Act, the Canada Labour Code and Treasury Board Standards;
- major activities include: Electromagnetic e.g. electric and magnetic fields at extremely low frequencies (ELF); Lasers and Electro-Optics e.g. sunlamps, health effects of increased solar exposure; and Acoustics e.g. reduction of machinery noise at source, diagnostic of ultrasound procedures.

Bureau of Chemical Hazards

1. PR-28 Air Quality

- coordinate risk assessment and risk management activities associated with both outdoor and indoor air quality, principally issues and programs relating to ambient air pollution i.e. ozone, acid aerosols, and on indoor air quality (IAQ) resulting from energy conservation measures.
- develop IAQ guidelines for five Priority Substances (Canadian Environmental Protection Act).
- activities include investigations into chemical characterization of air pollutants; animal studies to determine toxicity of single and multipollutant exposures; human clinical investigations; exposure assessments and modelling research; national survey and epidemiological studies.

Table A.2.1 PAR Comparison

a) Introduction (Project Description)
Bureau of Chemical Hazards

2. PR-32, New Chemicals and Biotechnology Products

- coordinates risk assessment and risk management activities associated with the exposure to new chemicals and biotechnology products;
- this activity operates under the New Substances Notification Regulations of CEPA, the Hazardous Materials Information Review Act (HMIRA), the Federal Program on Energy Research and Development (PERD), and the Workplace Hazardous Materials Information System (WHMIS);
- major tasks related to CEPA would be to conduct preliminary assessments of potential health risks of new chemicals and biotechnology products, within specified time frames, based on "intermediate" or "full" information requirement that must be submitted prior to manufacture or importation.

3. PR-33, Environmental Contaminants

- coordinates risk assessment and risk management activities associated with exposure to priority substances in the environment. This activity also includes work associated with the development of recreational water quality, multimedia, and ambient air quality guidelines. It does not include work on pollutants in the Great Lakes or in chemical dump sites;
- this activity operates under the Priority Substances List established under CEPA;
- a mechanism has been implemented to identify certain chemicals among the myriad found in the environment for assessment and possible regulation. Toxicology and mutagenicity research is carried out on chemicals in the environment deemed to be high priority and for which insufficient data exists to conduct risk assessment.

4. PR-34, Bioregional Health Effects Program

- coordinates risk assessment and risk management activities under the Great Lakes Health Effects Program (GLHEP), St. Lawrence Health Effects Program (SLHEP) and other Bioregional Programs. It is an inter-directorate program within the Health Protection Branch. For the purpose of this comparison, only GLHEP would be discussed.
- GLHEP complements other activities covered under the Department's responsibilities for CEPA and the Food and Drugs Act and coordinates its work with the federal Great Lakes Action Plan (DOE, DFO, DOT, CDA, DPW).
- major activities include: integrating health into the implementation of Remedial Action Plans; working with at-risk groups to assess and reduce exposure to specific environmental contaminants; undertake research to fill knowledge gaps relating low-level chronic exposure to Great Lakes Basin priority chemicals to subtle health impacts including psycho-social impacts; monitor human exposure to contaminants through the implementation of a human tissue bank; report regularly on human health and stewardship indicators; develop and implement basin specific health promotion strategies for five environmental health issues (not listed in report).

Table A.2.1 PAR Comparison

c) Long-Term Objectives Radiation Protection Bureau	c) Long-Term Objectives Bureau of Chemical Hazards
1. PR-03. X-Rays - The primary objective is to assess and manage health risks associated with devices that emit X-radiation; and - The secondary objective is to provide technical and scientific support to the radiation protection and other Directorate programmes.	1. PR-28. Air Quality -to identify the hazards associated with airborne contaminants; -to estimate the risks to human health associated with airborne contaminants; -to participate in the management of risks to human health associated with airborne contaminants; -to communicate the risks to human health associated with exposure to airborne contaminants.
2. PR-04. Non-Ionizing Radiation - risk assessment of devices that emit electromagnetic non-ionizing fields, noise and ultrasound and development of instrumentation and techniques for the accurate and reliable measurement of non-ionizing radiations; and - where a significant risk has been estimated, minimization of unnecessary exposure via the following methods of risk management: Risk communication and Regulatory action.	2. PR-32. New Chemicals and Biotechnology Products -To identify the hazards associated with new chemical substances and biotechnology products; -to estimate the risks to human health associated with new chemical substances and biotechnological products; -to participate in the management of risks to human health associated with new chemical substances and biotechnology products; -to communicate the risks to human health associated with exposure to new chemical substances and biotechnological products.
	3. PR-33. Environmental Contaminants -To identify the hazards associated with environmental contaminants; -to estimate the risks to human health associated with environmental contaminants; -to participate in the management of risks to human health associated with environmental contaminants; -to communicate the risks to human health associated with exposure to environmental contaminants.

Table A.2.1 PAR Comparison	
	c) Long-Term Objectives 4. PR-34. Bioregional Health Effects Program -determine the nature, magnitude and extent of effects on health associated with exposures to contaminants from all sources in the Great Lakes Basin, the St. Lawrence Basin and other bioregions; -develop and implement strategies to reduce or eliminate risks to human health related to pollution in the Great Lakes Basin, the St. Lawrence Basin and other bioregions; and -increase communication and consultation amongst agencies and the public and provide timely, useful information to foster action on health and environmental issues.

Table A.2.1 PAR Comparison
d) Resource Allocation

Bureau	PR #	91-92 Actual PY	91-92 Actual $(000)	92-93 Actual PY	92-93 Actual $(000)	93-94 Est. PY	93-94 Est. $(000)	94-95 Frcst. $(000)	94-95 Frcst. $(000)
RPB	PR-04	12.3	717.3	12.0	715.2	10.6	653.2	11.1	825.0
	PR-03	10.6	1257.1	15.15	1443.6	16.3	1825.6	15.4	1492.5
BCH	PR-28	13.6	3725.6	8.2	3664.4	15.12	3833.9	25.53	4572.1
	PR-32	23.57	2175.9	17.34	1898.1	26.04	2575.7	17.14	1877.8
	PR-33	23.94	3241.9	18.45	2431.2	30.0	3083.3	30.16	3534.7
	PR-34	26.59	3550.8	14.37	3306.4	24.0	3495.9	13.7	3256.3

Table A.2.1 PAR Comparison
e) Major Goals & Five Year Resource Plan

Bureau of Radiation Protection

1. PR-03. X-Rays

Five major goals were approved under this project area:

0301. to assess the cancer and other health risks associated with X-ray devices;
0302. to manage the cancer and other health risks associated with X-ray devices that are sold or resold in Canada;
0303. to manage the cancer and other health risks associated with X-ray devices under federal jurisdiction and, upon agreement with other jurisdictions;
0304. to increase the effectiveness of the X-ray Section in the education of Canadian x-ray workers and the general public and others; and
0305. to review the mandates and procedures used in providing service to client groups.

2. PR-04. Non-Ionizing Radiation

Seven major goals were approved under this project area:

1. to draft or adopt by reference regulations under the RED Act and the Food and Drugs Act and to amend existing regulation as required for: laser devices, sunlamps, noisy industrial machinery, ultrasound therapy devices, diagnostic ultrasound devices, ultrasonic lithotripters;
2. to enforce compliance with regulations under the Red Act and FDA for: microwave ovens, sunlamps, mercury vapour lamps, demonstration lasers, lasers scanners, ultrasound therapy devices, ultrasonic lithotripters, diagnostic ultrasound devices;
3. to develop safety codes and other safety guidelines for use by Labour Canada, other Federal Departments, and provinces on: extremely low frequencies; lasers; laser light show safety; environmental noise in neighbourhoods surrounding airports; industrial machinery noise; and if necessary, provide expert support to meet recommendations of safety guidelines and safety codes e.g., laser light show safety assessments, electromagnetic device assessments
4. to establish calibrated exposure facilities and develop methods for standardization of survey instrumentation for non-ionizing radiation
5. to research the effects of non-ionizing radiation on mammalian cells, tissue, living animals or man in support of risk assessment, and development and enforcement of regulations and preparation of safety standards and safety codes;
6. to provide expert advice to and prepare up to date reviews for the general public, government agencies, and industry on regulations, standards, safety procedures and health effects of exposure to non-ionizing radiations, to collaborate with WHO, IRPA and URSI in these areas and to assist in organization of conferences, working groups, etc. and to continue routine administrative duties.
7. to prepare scientific background documents, survey reports, risk assessment documents and educational literature.

Table A.2.1 PAR Comparison
e) Major Goals & Five Year Resource Plan

Bureau of Chemical Hazards

1. PR-28. Air Quality

Twenty two major goals were approved under this project area:

2810 develop health criteria and guidelines for ozone and acid aerosols by 1996;
2811 determine the toxicity of oxidants, complex mixtures, acid aerosols, and other air pollutants using in vivo and in vitro methods;
2812 estimate the health-related costs associated with LRTAP (in 2816);
2813 provide expert advice, develop and contribute to information enhancing public awareness on the health effects of air pollutants;
2814 assess the potential impact on indoor air quality on health including federal energy conservation measures being promoted by the panel on energy research and development (PERD Task 1);
2815 develop and publish a protocol for the investigation of indoor air quality problems in offices and institutional buildings by means of a Federal-Provincial Working Group;
2816 conduct multi-disciplinary studies to determine the susceptibility of population sub-groups to airborne contaminants;
2817 characterize human exposure to ambient airborne pollutants;
2818 determine the need for the nature of research on the human health impact of global climate change;
2819 through 2831 are proposed new goals to be discussed in section G.

2. PR-32. New Chemicals and Biotechnology Products

Fifteen major goals approved under this project area:

3201. develop a management scheme and evaluation procedure for each level of notification for new substances (including biotechnology products), as required by NSNR of CEPA;
3202. review submissions from industry and assess the health risks posed by new substances/biotechnology products within the time-frames specified by CEPA and its regulations. Where necessary develop control measures in consultation with DOE.
3203. review submissions on industrial chemicals received from HMIRC, provided by the manufacturer or importer (as required under the HPA), and advice on their adequacy within mutually acceptable time-frames;
3204. Develop test protocols for initial assessment of the potential toxicity of, and levels of exposure to, new biotechnology products;
3205. Develop improved test and procedures for estimating toxicity and human exposure to new industrial chemicals notified under CEPA;
3206. Determine the potential impact to human health of new energy sources under development through the program on Energy Research and Development;
3207. Develop information materials to enhance public awareness of regulatory activities related to the risks to health posed by exposure to industrial and commercial chemicals and biotechnology products; and
3208. Reduce the number of experimental animals required for the testing of chemicals by developing alternative in vitro tests and by modifying live animal studies to require fewer animals;
3209 through 3215 are proposed new goals for 1994/95 to be discussed in section G.

Table A.2.1 PAR Comparison
e) Major Goals & Five Year Resource Plan

3. PR-33. Environmental Contaminants

Twenty major goals approved under this project area:

3301. determine the toxicity of specific environmental chemicals and complex mixtures;
3302. improve the predictive capability of toxicology testing by developing better indicators and measures for genotoxic, oncogenic, reproductive and immunotoxic endpoints;
3304. complete assessment on 50 priority chemicals under CEPA and to evaluate health hazards of environmental pollutants referred to BCH by government departments and agencies and recommended controls as required;
3305. implement the use of IRPTC as database to address national issues by promoting its use and cooperating with provinces to augment its scope;
3308. develop a database of residue levels of pollutants in humans and the environment in order to determine levels of exposure, assess potential health impacts and identify populations at risk;
3311. develop tests that might lead to the detection of the early sequential events in the etiology of cancer and provide a more precise basis for the estimation of risk;
3313. develop information materials to enhance public awareness of the risks to health posed by exposure to priority substances;
3314. develop a molecular toxicology approach for "Risk" Assessment through the validation of multi-component, gene-based biomarkers to measure early changes in cell functions following exposure to cytotoxin;

3315 through 3326 are proposed new goals for 1994/95 to be discussed under section G.

4. PR-34. Bioregional Health Effects Program

Forty two major goals approved under this project area, the following lists the major goals pertaining to the Great Lakes Effect Program:

3401. develop binational media quality objectives for 12 specific chemicals and 4 health based binational ecosystem objectives and review 20 existing International Joint Commission water quality objectives for the protection of human health (Annex 1);
3402. collaborate with Federal and Provincial agencies on the development of strategies for the clean-up of 17 'areas of concern' by providing advice on health related aspects of the 'Remedial Action Plans'(Annex 2);
3403. assess the extent of human exposure to contaminants that bioaccumulate in tissue and are found in the Great Lakes Basin (Annex II);
3404. assess and provide advice on the impact of contaminants in the Great Lakes basin on human health by conducting 4 epidemiological and 16 laboratory studies;
3405. assess human exposure to and provide advice on the health impacts of airborne contaminants in the Great Lakes Basin; and
3406. develop and implement a strategic public participation plan and provide timely information to enhance public awareness of risk to health from pollutants in the Great Lakes Basin (all Annexes);

3407 through 3499 are proposed new goals for 1994/95 to be discussed under section G.

Table A.2.1 PAR Comparison
f) Achievements

Bureau of Radiation Protection

1. PR-03, X-Rays

Achievements for approved goals included:

0301. two of four subgoals were completed under this major goal
- achievements to maintain x-ray equipment inventory, inspection history and problem report data base included: database support provided as required and training of data entry person;
- achievements to evaluate the risk associated with selected radiology procedures and make recommendations to control risk and communicate results are still in progress. Three draft reports were produced. Availability of frequency data for radiological procedures is being investigated;

0302. all subgoals were completed under this major goal
- achievements to ensure compliance with the RED regulations for 100 x-ray emitting devices by performing laboratory and field analyses and processing voluntary submissions included: test of one dental x-ray unit, eight non-medical x-ray units in laboratory, processing of 300 TV submissions;

0303. two of three subgoals were completed under this major goal
- achievements to develop techniques for mail-out testing of x-ray equipment subject to BRMD surveillance and to provide instruction to x-ray equipment operators included: preliminary work done to contact private testing companies. Proposal written for pilot project in 92/93 to be followed by full implementation if successful. Instruction provided to 200 operators;

0304. most of the subgoals were completed under this major goal
- achievements to investigate the effectiveness of various vehicles for the communication of information of risk management and for the training of x-ray equipment uses in quality control and other methods of reducing doses to patients and operators of diagnostic x-ray equipment, in cooperation with the Canadian Association of Radiologists and the Canadian Association of Medical Radiation Technologists included: discussions with CAMRT. Participation in CAMRT annual meeting and in meeting of Hospital Accreditation Board. The Board acknowledged the help received by RPB in the preparation of x-ray QA guidelines. CAMRT was approached to participate in a quality assurance workshop in Vancouver, but they declined;
- achievements to increase the effectiveness of the X-ray Section in the education of Canadian radiation workers and the general public on x-ray effects and safety included: updating of the Baggage X-ray and safety course, 3 radiation safety courses given to DOT. A video tape "X-Ray Effects and the Safety of Workers and the General Public". A computer aided training (CAT) display "X-ray Safety for the Layman - Questions and Answers (report in preparation). The text for a course "Radiation Safety for Baggage X-ray Equipment" (awaiting ministerial concurrence for publication). Technical reports e.g. "Risk Resulting from the Use of Software Control Systems in Medical Devices" (delayed by involvement with Theratronics software review.
- achievements to prepare safety codes included: five Revised Safety Code publications: Dental X-ray, Baggage X-ray, X-ray Diffraction, and Medical X-rays and three New Safety Code publications: Computed Tomography, Test Procedures and Breast Imaging.

0305. not available

Table A.2.1 PAR Comparison
f) Achievements

2. PR-04, Non-Ionizing Radiation

Achievements for approved goals included:

1. only one of the five subgoals were completed under this major goal;
2. seven of eight subgoals were completed under this major goal
   - some achievements to prepare and conduct compliance program to implement existing regulations under the RED Act included: evaluation of 70 microwave oven submissions. An update to regional health inspectors was also mailed. Evaluation of 5 models of sunlamps. evaluation of 42 mercury vapour lamps, 8 models of demonstration lasers, and 7 models of lasers scanners. 50 models of lasers evaluated for safety. 35 models of ultraviolet equipment and IR equipment evaluated for safety. 43 manufacturers and distributors of HID lamps (test for UV emissions) were contacted, 10 manufacturers offer 781 models for sale in Canada; results being tabulated. Completed ultrasound therapy devices inspections as required. No progress for ultrasonic lithotripters;
3. most subgoals were completed under this major goal
   - some of the achievements to prepare safety guidelines and provide assistance with compliance for Labour Canada, other Federal Departments, and the provinces included: the publication by CSA, July 1992 of the revised Guidelines for Laser Safety in Health Care Facilities;
4. nine of the fifteen subgoals were completed under this major goal
5. eleven of sixteen subgoals were completed under this major goal
   - some achievements to research biological effects on non-ionization radiation included: literature review to characterize UV response of mouse skin cancer - general planning and dosimetry setup (collaboration with J. McLean, Premarket);
6. seven of nine subgoals completed under this major goal
   - some achievements to provide expert advice to and prepare up to date reviews included: interaction with DOE to respond to the recommendations of the Standing Committee on Environment report "Ozone Depletion: Acting Responsibility" and to produce a memorandum to cabinet on the official response position of the government. Participated in organizing committee follow-up meetings on the recommendations of the symposium on UV-related diseases Finalized the "Interim information Statement on the Health effects of Ultraviolet Radiation and the Ozone Layer Thinning" for the Federal-Provincial Sub-Committee on Radiation Surveillance. Assisted the Minister of the Environment Canada during press conferences announcing (a) the UV-Index program and (b) the Environmental Indicator Bulletin. Interacted with MacLean Hunter to explore the possibility of joint venture with J & J to extend the co-publication "The Sun, Your Baby and You: A parent's guide to sun protection" by 500,000 copies and to produce a poster on UV exposure health effects for school kids and teenagers;
7. two of three subgoals were completed under this major goal
   - some of the achievements to complete educational literature on the health effects of ultraviolet exposure included: production and publication of HPB issues "Thinning of the Ozone Layer--The Health Effects and "Preventing Skin Cancer! It's Up To You". 100,000 additional magazine inserts "The Sun, Your Baby and You: A parent's guide to sun protection" reprinted and 8,000 supporting posters produced.

Table A.2.1 PAR Comparison
f) Achievements

Bureau of Chemical Hazards

1. PR-28. Air Quality

Achievements of approved goals include:

2810 under this major goal, three subgoals were completed, one was cancelled and one was behind schedule
- some achievements to develop and publish in collaboration with DOE, criteria documents for the Canadian Ambient Air Quality Objectives and Guidelines included: the approval of the terms of reference and work plan for the revitalized Working Group on Air Quality Objectives and Guidelines by CEPA/FPAC, the initial ranking of top five chemicals from a previous lists of chemicals (?);
- behind schedule is the development of draft guidelines for 5 indoor air pollutants (xylenes, toluene, 1,4-dichlorobenzene, benzene and tetrachloroethylene) to be used in updating the Exposure Guidelines for Indoor Air Quality.

2811 two subgoals were completed and two were deferred under this major goal;

2812 goal deleted;

2813 two subgoals were completed, one was deleted and one was deferred under this major goal
- some achievements to provide information to government, other agencies and the general public on ambient and indoor air quality issues relating to human health included: Health Issue sheets - Smog and your Health and Ozone; information packages were prepared concerning indoor quality; measurement of organics and energy related topics; a paper on the guidelines for indoor air quality was finalized and presented at the annual meeting of the Canadian Lung Association;

2814 five subgoals were completed and one was behind schedule under this major goal
- achievements to design and carry out a Canadian study of the association between health and indicators of home dampness and mould included: development of a sleep system recording device for the objective determination of cough and wheeze symptoms. Research proposal designed to determine the biological significance of reported "damp and mouldy" homes with respect to fungi, fugal products, bacterial endotoxins and the major cat and dust mite antigens is being develop in collaboration with Agriculture Canada and the Canadian Mortgage Housing Corporation, a paper entitled Ecology of Fungi in Human Dwellings was published in the Journal of Medical and Veterinary Mycology, 1992, Vol. 3, Supplement 1. Another article entitled The Prevalence of Childhood Asthma Across Canada was submitted to the International Journal of Epidemiology;

2815 n/a;

2816 deleted;

2817 five subgoals were completed and one was deleted under this major goal
- achievements to develop procedures for predicting the effects of energy conservation measures on personal exposure to VOCs in Canadian buildings included: development of analytical methods, predictive modelling, and examination of factors which influence IAQ;

2818 achievements to examine the effects of global climate change on human health included: a two-day workshop entitled Weather and Health: Needs an Relevance to Canadians organized in collaboration with DOE and the Canadian Meteorological and Oceanographic Society.

2819 through 2831 are new proposed goals and are included in section G.

Table A.2.1 PAR Comparison
f) Achievements

Bureau of Chemical Hazards

2. PR-32. New Chemicals and Biotechnology Products

Achievements of approved goals included:

3201. only two of six subgoals were complete under this major goal
- some achievements to finalize implementation of joint management schemes for the tracking and assessment of new chemicals and biotechnology products (as required under Section 28 of CEPA) in collaboration with DOE included: preparation of a Memorandum of Understanding for a shared tracking system with DOE. This goal is not finalized because implementation of the notification regulations was delayed;

3202. two of the three subgoal were completed under this major goal;
3203. all subgoals (2) were completed under this major goal;
3204. all subgoals (2) were completed under this major goal;
3205. all subgoals (2) were completed under this major goal;
3206. two of three subgoals were completed under this major goal;
3207. n/a; and
3208. all subgoals (2) were completed under this major goal.

3209 through 3215 are new proposed goals.

3. PR-33. Environmental Contaminants

Achievements of approved goals include:

3301. four of six subgoals were completed under this major goal
- some achievements to investigate the subchronic toxicity of di-octylphthalate and chlorinated paraffins included: a 90-day study on chlorinated paraffins. no apparent clinical sign of toxicity was observed with any of the animals under study. Clinical chemistry, haematology, histopathology and tissue residue analyses were being carried out in 93/94;

3302. goal completed;
3304. eleven of twelve subgoals were completed under this major goal
- some achievements to complete preparation of health sections of assessments for compounds in Group 1, 2, and 3 of the PSL/CEPA included: publication of 44 PSL assessments;
- achievements to participate with DOE in developing a strategy for selecting candidate substances for PSL II included: development of a list of 544 candidate chemicals for second PSL through compilation of existing lists and consultation; in collaboration with DOE, develop draft screening criteria and screened pilot list of 30 compounds; completed scoring of additional 130 compounds;

3305. goal completed;
3308. two subgoals completed, one on-schedule and one deleted under this major goal;
3311. one of two subgoals completed;
3313. n/a;
3314. goal completed
- achievements to develop a molecular toxicology approach for "Risk" Assessment through the validation of multi-component, gene-based biomarkers to measure early changes in cell functions following exposure to cytotoxin included: an evaluation of human, primate and rodent gene inventories for design and construction of prototype collections of "toxicity" markers was initiated and some custom gene primers were commercially synthesized. A study describing a prototype assay involving only mitochondrial genes was tested and shown to be feasible for use (collaboration with National Research Council of Canada scientists);

3315 through 3326 are new proposed goals for 1994/95.

Table A.2.1 PAR Comparison
f) Achievements

Bureau of Chemical Hazards

4. PR-34, Bioregional Health Effects Program

Achievements of approved goals include:

3401. all subgoals (2) completed under this major goal;

3402. one of two subgoals completed under this major goal;

3403. eight of the ten subgoals were completed and two were cancelled due to,lack of funds under this major goal
- achievements to complete analyses of brominated organics, continue analyses of toxaphene and initiate analyses of organometallic in human tissue from the Great Lakes Basin included: the analysis of chloronapthalenes in human adipose tissue, a manuscript was published. An analytical protocol was developed to bromodiphenyl ethers. Three specific toxaphene congeners were synthesized under contract;
- achievements to assess the feasibility of using tissue from human placentas to monitor exposure to organochlorine contaminants in women residents in the Great Lakes Basin included: workup of one placenta. The extract was fractionated (2 fractions) and analyzed by GC/MS. The fractionation protocol was modified to remove interference from cholesterol found in fraction 2. A number of PCB congeners and common OC pesticides were found;

3404. all subgoals were completed under this major goal
- achievements to determine effects of priority Great Lakes contaminants in reproductive endpoints included: screening of six PCB congeners for ovarian toxicity using a whole organ (ovary) perfusion system. Completion of the effects of methyl-mercury on reproductive endpoints in the male rat. Contracts were awarded to the Ottawa Civic Hospital and the University of Illinois;

3405. n/a;

3406. all subgoals were completed under this major goal;

3407 through 3499 are proposed new goals for 1994/95.

f) Progress Report on Goals for 1993-94. A progress report for each major goal and their subgoals is given in this part of the report for both RPB and BCH project areas.

Table A.2.1 PAR Comparison
g) Proposed Goals (1994-1995)

Bureau of Radiation Protection

1. PR-03, X-Rays

No new major goals were proposed for 1994/95:

0301. one new subgoal was added to conduct an equipment survey of 200 mammographic installations in Canada, analyze the results and prepare reports;
0302. no new subgoals added;
0303. no new subgoals added;
0304. none new subgoal added to implement quality assurance programmes at federal medical and dental facilities;
0305. no new subgoals added.

2. PR-04, Non-Ionizing Radiation

No new major goals were added to 1994/95

Bureau of Chemical Hazards

1. PR-28, Air Quality

Twelve new goals were proposed for 1994/95:

2819. describe the level and physiochemical nature of semivolatiles in the indoor environment by 1999;
2820. assess the inhalation toxicity of ground level - 03, acid aerosols, and particles by 1997 and methanol fuel mixtures by 1999;
2821. identify the significant human health hazard to acid aerosols, particles, ground level 02 and mould, fungi, and bacteria by 1997;
2822. measure the levels of 10 oxygenated and 14 aromatic organic airborne contaminants by 1999;
2823. develop predictive modelling and measurement techniques and ground - level 02 by 1997 and VOCs by 1999;
2824. characterize the population exposed to acid aerosols, particles and ground - level 03 by 1997;
2825. evaluate the health risks associated with 6 fuel-related compounds by 1997;
2826. estimate the risks posed by global climate change on the health of Canadians by 1997;
2827. develop national air quality objectives for 7 air pollutants by 1997;
2828. develop a framework for indoor air quality by 1997;
2830. adequate and timely response to EARP submissions, scoping documents, panel reports, etc. as instructed for the Department by 1997; and
2831. implement a risk communication strategy for 4 airborne contaminants by 1997.

Table A.2.1 PAR Comparison
g) Proposed Goals (1994-1995)

Bureau of Chemical Hazards

2. PR-32. New Chemicals and Biotechnology Products

Seven new goals were proposed for 1994/95:

3209. develop test protocols necessary for assessing the infectivity and toxicity of, and exposure to, new biotechnology products, as required under CEPA by 1996;
3210. develop or refine 5 tests and procedures for estimating toxicity of new industrial chemicals notified under CEPA by 1999;
3211. review submissions from industry and assess the potential health risk posed by new substances/biotechnology products within time frames specified by CEPA and its regulations;
3212. develop, acquire or refine 5 new existing methods for estimating exposure and assessing risk associated with the use of new chemicals under CEPA by 1999;
3213. complete the approach for assessing potential health risks associated with new biotechnology products and prepare a manual for evaluation as required under CEPA by 1996;
3214. develop controls for new chemical substances and biotechnology products in a timely fashion as required by CEPA in collaboration with DOE; and
3215. provide timely advice to industry on regulatory requirements and develop information materials to enhance public awareness related to the CEPA new substances program.

3. PR-33. Environmental Contaminants

Twelve new goals were proposed for 1994/95:

3315. determine the toxicity of 5 priority substances or complex mixtures using laboratory studies by 1997;
3316. identify human reproductive and germ cell health hazards resulting from exposure to Priority Substances;
3317. establish a monitoring programme for the detection of genetic effects in exposed human populations in degraded environments by 1997;
3318. establish improved mechanistic-based risk extrapolation models for gem cell mutagenicity, oncogenicity, and reproductive effects by 1997;
3319. complete assessments on priority substances on PSL II under the CEPA and evaluate health hazards of other environmental pollutants referred to the Bureau as required by 1999;
3320. develop an in vivo gene expression based bio-indicator test for tumour promotion by 1999, gene based biomarkers, of autotoxicity by 1998, and 3 biomarkers of reproductive toxicity by 1999;
3321. evaluate 600 CEPA Section 17 notifications and recommended regulatory controls when necessary by 1997;
3322. transferred to PR-00;
3323. develop control options for 15 PSL I substances declared "toxic" under CEPA by 1999;
3324. assess and manage human health impacts of waste management practices under CEPA;
3325. complete the development of 39 soil guidelines for remediation of contaminated sites by 1994;
3326. provide timely effective and coordinated communication of issues on priority and/or toxic substances.

Table A.2.1 PAR Comparison
g) Proposed Goals (1994-1995)

Bureau of Chemical Hazards
4. PR-34, Bioregional Health Effects Program

Twenty two new goals were proposed for 1994-95

3407. integrate human health considerations into the remediation of all 17 AOCs;
3408. participate in binational and federal-provincial activities that address health aspects in AOCs
3409. provide advice and information directly to environmentally affected communities on health exposure/risk issues;
3410. evaluate health risks and develop exposure reduction strategies for specific risk groups;
3411. develop specific health criteria and determine potential health consequences of the best available technologies for site cleanup in the great Lakes Basin;
3412. focus 7 research studies on the exposure and susceptibility of targeted populations;
3413. quantify and evaluate human population exposures to PTS in the Great Lakes Basin to identify extent of exposure and to track exposure reductions over time;
3414. develop and implement a human tissue bank for the Great Lakes Basin;
3415. monitor and evaluate the levels of 20 contaminants in three tissues collected from basin residents and establish trends over time, by age, etc.
3416. through 3423 were identified as major goals but they were not listed under proposed goals;
3424. develop and implement a basin specific health promotion strategy for 5 health issues by 1995;
3425. promote stewardship and conservation activities within communities;
3426. research the psycho-social aspects of environmental contamination;
3430. produce two state of health reports for 1994 and 2000;
3431. strategically manage and coordinate the program with 20 meetings of the public advisory committee, 5 interagency planning and information consultations, 15 binational coordinating meetings and 5 program review sessions;
3432. provide integrated advice on environmental exposures and risks to health in the Arctic and prepare 3 international reports by 1997;
3499. St. Lawrence health effects program coordination and implementation strategies.

Table A.2.1 PAR Comparison
i) Communication Plan

Bureau of Radiation Protection

1. PR-03, X-Rays

Communication between the X-ray Section and its clients is direct, or indirect via professional societies and organizations. Methods of communicating information include:

- publications (safety codes, issues, guidelines), video tapes, electronic media (e-mail), computer bulletin boards, written reports (e.g., X-ray equipment results), lectures, workshops, training courses and both on and off-site client consultation and instruction.

2. PR-04, Non-Ionizing Radiation

The communication plan include publications (e.g., Transient field Measurements, Cancer co-promotion by magnetic fields), conferences (school education material on over-exposure to solar UV, Issues on the effects of solar UV on health), issues (noise induced hearing loss in children), presentations (Environmental Assessment and Review Panel on the health effects of exposure to noise from low flying military training flights)

Bureau of Chemical Hazards

1. PR-28, Air Quality

Objectives of the communication strategy for this PAR are:

- maintain and support public awareness initiatives addressing air quality and health issues through development of public information materials, delivery of presentations and publishing proceedings of workshops and formal meetings. A communication protocol to be developed to include an inventory of available publications and a circulation list of key stakeholders (e.g. the Canadian Lung Association, the Canadian Global Change Program) to enhance public awareness and facilitate information dissemination;
- provide support to clients by producing information materials, providing advice and contributing to documents/report on air quality issues (e.g. the Canadian Smog Advisory Program);
- publish peer reviewed papers and deliver scientific presentations on air quality and health effects issues (e.g. guidelines for interpretation of microbiological in indoor air environments, specifically mould and fungi, manuscripts on the exposure of Canadians to selected airborne organics and information on the health significance of this exposure).

2. PR-32, New Chemicals and Biotechnology Products

The communication plan for this project area encompasses three areas:

- informing industry of their responsibilities under the New Substances Notification Regulations (e.g. information pamphlet on NSNR for industry in collaboration with DOE);
- participating in scientific workshops (preparation and publication of research work conducted on transgenic mice in scientific journals); and
- publishing research and related work in scientific journals (e,g. publication of two pairs on an environmental fate model for organic chemicals)

Table A.2.1 PAR Comparison
i) Communication Plan

Bureau of Chemical Hazards

3. PR-33, Environmental Contaminants

The communication plan for this project include the publication of pamphlets or reports e.g. the CEPA Approach Paper, manuscripts in the Journal of Regulatory and Pharmacology for 33 individual substances or groups from PSL 1, along with the approach and assessment. Publication of three journal articles concerning the "Community health hazards associated with waste incineration and landfill". Presentations e.g. "Mercury exposure for the Canadian population: a Multimedia Analysis", and "Human Exposure to Mercury may Decrease as Acidic Decomposition Increases".

4. PR-34, Bioregional Health Effects Program

The communication plan for this project include:

- reviews, workshops, TV productions, displays, reports, establishment of working groups, development of consultation strategies for communication and evaluation of activities.

Table A.2.1 PAR Comparison
j) Measurable Outputs

Bureau of Radiation Protection

1. PR-03, X-Rays

Measurable outputs include:
- regulations and amendments (drafts); safety codes; assessment of devices; prototype or new devices tested; regulatory consultations; regulatory submissions; lectures; courses; reports; papers.

2. PR-04, Non-Ionizing Radiation

Measurable outputs include:
- regulations and amendments (drafts); safety codes/guidelines; assessment of devices; prototype or new devices tested; routine calibrations; measurement/calibration procedures; submission guidelines; research papers; risk estimates; devices assessed for risk; devices assessed for compliance; reports; papers.

Bureau of Chemical Hazards

1. PR-28, Air Quality

Measurable outputs include:
- ministerial letters, briefings, media contacts, public enquiries, publications, submissions, reports, contributions to reports inside and outside EHD, reviews, information/issues, presentations at scientific meetings, other meetings, other correspondence.

2. PR-32, New Chemicals and Biotechnology Products

Measurable outputs include:
- ministerial letters, briefings, media contacts, public enquiries, publications, submissions, reports, contributions to reports inside and outside EHD, reviews, information/issues, presentations at scientific meetings, other meetings, other correspondence.

3. PR-33, Environmental Contaminants

Measurable outputs include:
- ministerial letters, briefings, media contacts, public enquiries, publications, submissions, reports, contributions to reports inside and outside EHD, reviews, information/issues, presentations at scientific meetings, other meetings, other correspondence.

4. PR-34, Bioregional Health Effects Program

Measurable outputs include:
- searches, enquiries, assistance, accreditation, on line demos, manuals, booklets, courses, records, assessment reports, public information, ministerial letters, briefings, media contacts, public enquiries, publications, submissions, reports, contributions to reports inside and outside EHD, reviews, information/issues, presentations at scientific meetings, other meetings, other correspondence.

Table A.2.1 PAR Comparison
k) Documents/Publications

Bureau of Radiation Protection

1. PR-03, X-Rays

Document/publications include:
- numerous abstracts, proceedings, reports, information/alert letters, regulation, Journal publications, books, paper/lectures presented and courses given, guidelines.

2. PR-04, Non-Ionizing Radiation

Document/publications include:
- numerous abstracts, proceedings, reports, Journal publications, books, papers, seminars, RPB information material.

Bureau of Chemical Hazards

1. PR-28, Air Quality

Document/publications include:
- numerous abstracts, proceedings, reports, Journal publications, books, papers, lectures presented and courses given..

2. PR-32, New Chemicals and Biotechnology Products

Document/publications include:
- numerous abstracts, proceedings, reports, Journal publications, books, papers, lectures presented and courses given.

3. PR-33, Environmental Contaminants

Document/publications include:
- numerous abstracts, proceedings, reports, Journal publications, books, papers, lectures presented and courses given.

4. PR-34, Bioregional Health Effects Program

Document/publications include:
- numerous abstracts, proceedings, reports, information/alert letters, regulation, Journal publications, books, papers, lectures presented and courses given.

Table A.2.1 PAR Comparison
I) Major Problem Areas

Bureau of Radiation Protection

1. PR-03. X-Rays

Major problem areas for which no activities were proposed included:

- publication of the X-ray Diffraction Safety Code. Increase in unsafe facility operations would cause unnecessary radiation exposures and accident which would ultimately require more resources to address;
- research into safety of mammography x-ray equipment, including dose measurement, image quality, study of test phantoms, artifacts and survey equipment performance;
- research into the safety of bone densitometers;
- publication of the Medical X-ray Equipment Part XII in Canada Gazette Part II;
- Safety surveys of x-ray equipment in federal facilities.

2. PR-04. Non-Ionizing Radiation

Major problem areas for which no activities were proposed include:

Electromagnetic:
- assessment of potentially unnecessary exposure to electromagnetic fields to the patient and medical practitioners from some medical devices;
- assessment of exposure to electromagnetic fields from various devices in the working environment, e.g. power lines, radars, portable radio transmitters.

Lasers and Electro-optics:
- assessment of whether the Branch criteria for standards development are met by standards under the RED Act for : infrared heaters, ultraviolet industrial sterilizers, sunlamps;
- health criteria documents for UV and IR equipment;
- assessment of unnecessary strong light exposure of premature neonates;
- destructive laboratory testing of High Intensity Discharge Lamps.

Acoustics:
- assessment of ultrasound cancer therapy;
- ultrasonic lithotripter standard;
- assessment of active noise control devices for reduction of machinery noise at source; and
- high speed rail noise guidelines.

Bureau of Chemical Hazards

1. PR-28. Air Quality
None identified.

2. PR-32. New Chemicals and Biotechnology Products
None identified.

3. PR-33. Environmental Contaminants
None identified.

4. PR-34. Bioregional Health Effects Program
None identified

WORKING DOCUMENT B: RADIATION PROTECTION BUREAU INSPECTIONS UNDER THE RED ACT

This summary provides background information on the activities of the Radiation Protection Bureau and the inspections performed by two sections of the Bureau, the X-Ray and Non-Ionizing Sections.

1. Background

The Radiation Protection Bureau (RPB) is one of the four Bureaux of the Environmental Hazards Directorate, Health Protection Branch. The Bureau operates under the Radiation Emitting Devices (RED) Act, the Food and Drugs Act (FDA), Treasury Board Standards (TBS), the Canada Labour Code (CLC), National Health and Welfare Act (NHWA) and the Atomic Energy Control (AEC) Act.

Radiation Emitting Devices Act. Activities under this Act include: the drafting of regulations; testing and inspecting devices; providing advice to manufacturers, provinces and users; carrying out or participating in compliance and follow up actions, in addition some of the compliance actions of the former Field Operations Directorate will default to RPB; and conducting research.

Food and Drugs Act. Activities under this Act include an informal agreement with the Bureau of Medical Devices. RPB deals with radiation hazards connected with medical devices using radioisotopes.

Canada Labour Code. Activities under the code are drawn from the Memorandum of Understanding between the former Departments of National Health and Welfare and Labour. The MOU dictates Health Canada to provide inspectors to accompany Safety Officers from Labour, provide expert advice and radiation safety courses, and maintain a registry of radiation emitting devices reported by employers.

Department of National Health and Welfare Act. Activities under this Act include investigation and research into public health and welfare; and collection, publication and distribution of information.

Treasury Board Standards. Activities under TBS include preparation of safety codes and guidelines; inspection of devices and facilities; instructing owners and operators; providing advice to federal departments and individual employees.

Atomic Energy Control Act. Although not often mentioned in the Bureau's activities, a Memorandum of Understanding between the Department of National Health and Welfare and the Atomic Energy Control Board was signed in March 30th, 1981. The MOU's purpose was to ensure full cooperation between the Board and the Department in the development and adoption of standards, criteria and objectives for the protection of the health of the public, and of workers at licensed nuclear facilities, including those handling prescribed substances, insofar as such standards, criteria and objectives relate to production and use of atomic energy.

RPB's Organizational Structure. The Bureau consists of three divisions:

Environmental Radiation Hazards Division, which investigates the potential effects on the Canadian population from natural and man-made sources of environmental radio-activity and from internally-deposited radioactivity.

Occupational Radiation Hazards Division, responsible for the National Dosimetry Services (NDS) and the National Dose Registry (NDR) programs **(not included in this evaluation).**

Consumer and Clinical Radiation Hazards Division, responsible for regulatory activities pertaining to non-ionizing and x-ray radiation and radiopharmaceuticals pursuant to the RED Act and Regulations and the Food and Drugs Act and Regulations. A major portion of the x-ray and non-ionization radiation activities is undertaken pursuant the Canada Labour Code and Treasury Board Standards.

Resources. In Fiscal Year 1994/95, the Bureau resources consisted of 75.2 person-years and a total budget of $5.8 million. RPB inspections are mainly the responsibility of the Consumer and Clinical Radiation Hazards Division. This Division consists of four sections: X-Rays, Non-Ionizing Radiation, Radiopharmaceuticals and Radiobiology and operates with 31.3 person-years, including seven inspectors. Table B.1 below shows the Bureau's distribution of resources for fiscal year 1994/95.

TABLE B.1. RADIATION PROTECTION BUREAU - BUDGET AND RESOURCE ALLOCATION 1993/94.

Bureau/Division/Section	FTEs (#s)	Salaries ($000)	Other Oper. ($000)	TOTAL ($000)
Radiation Protection Bureau	78.1	3650.9	2322.1	5888.0
Occupational Radiation Hazards	27.0	n/a	n/a	n/a
Environmental Radiation Hazards	20.8	n/a	n/a	n/a
Consumer and Clinical Radiation Hazards	31.3	n/a	n/a	n/a
X-Rays	11	n/a	n/a	n/a
Non-Ionizing Radiation	10	200.17	n/a	n/a
Radiopharmaceuticals	6	n/a	n/a	n/a
Radiobiology	4	n/a	n/a	n/a
Total Environmental Hazards Directorate	389	21823.9	19592.5	41768.5

Source: EHD

2. Inspections

The character of hazards and modus operandi are different in the X-Ray and Non-Ionizing Sections, and they are described below.

2.1 X-Ray Section Inspections.

The health hazards of exposure to x-radiation, somatic (cancer) and genetic are well established. There is a broad international consensus on relation between the radiation dose and level of risk, as summarized in publications of the International Commission on Radiological Protection (ICRP). Therefore, the ultimate aim of the X-Ray Section's activities is to reduce the radiation dose Canadian population is receiving from man-made sources of x-radiation. There is strong evidence (see Appendix B) that exposure has been reduced in RPB inspected remote locations from 1975 to 1994.

2.1.1 Regulations

Regulations are in force for nine classes of x-ray emitting devices (see Devices list in Appendix B.1); a tenth class is in the final stages of preparation. The preparation of any particular regulation extends over a number of years, and the intensity of involvement depends on the stage in which the draft is. Table B.2 below shows the resources allotted for the preparation and maintenance of regulations.

TABLE B.2. RESOURCES ON REGULATION DRAFTING AND MAINTENANCE

Fiscal Year	90/91	91/92	92/93*	93/94	94/95
Person Months	3.14	2.79	6.1	1.0	2.8
Salaries ($000)	16.6	18.0	23.2	3.8	13.4
Operating ($000)	0.1	0.9	4.3	0	4.7

* because of PMRS problems, starting in 1992/93 the planning figures are used

Source: RPB

The Section staff also participates in national and international standardization. Possibility of using other national or international standards in lieu of regulations is under investigation. The level of resources in this area is shown in Table B.3 below.

TABLE B.3. RESOURCES ON INTERNATIONAL AND NATIONAL STANDARDIZATION

Fiscal Year	90/91	91/92	92/93*	93/94	94/95
Person Months	N/A	1.44	3.15	16.0	5.0
Salaries ($000)		7.8	12.0	60.5	24.0
Operating ($000)		4.1	2.2	8.0	10.0

* because of PMRS problems, starting in 1992/93 the planning figures are used

Source: RPB

2.1.2 Radiation Safety in Federal Departments.

The X-Ray Section is responsible for checking and promoting radiation safety of equipment operated by or for Federal Departments. This equipment includes medical x-ray machines operated in Indian reserves, veteran hospitals and federal penitentiaries, customs, or in departmental laboratories.

Several approaches are combined to discharge this responsibility. The inspection unit provides a systematic radiation safety surveillance. Inspectors visit individual installations to check the radiation safety of x-ray units and installations, and to verify the operating procedures. In the course of these visits, they also give instruction on safe operation, basic problem recognition, and quality control procedures to personnel responsible for the installation. Minor safety or operational problems may be corrected on the spot. After each visit, a report summarizing the findings is sent to an appropriate manager (usually the zone director), so that corrective actions can be coordinated within the zone. If the inspection revealed any serious problem, the facility is ordered to ensure its correction within specified time. Where the radiation safety may be compromised, a restricted use order is issued or, in extreme cases, the unit is taken out of service. The follow-up is by phone and mail, and the correction is verified during the next planned visit.

There is no legally binding testing schedule. The inspection unit inspection visit plans are according to the following approximate test intervals:

- medical and dental x-ray equipment, 3-5 years; and
- non-medical x-ray equipment, 2-3 years.

The inspection visit plans take into consideration new installation, major repairs or relocation of equipment.

In addition to servicing Federal Departments, the Inspection Unit provides similar services to Prince Edward Island and Northwest Territories. An agreement to provide a regular service is under negotiation with the Government of Yukon. In these cases, the clients reimburse the Department for the operating cost of service. A full cost recovery scheme is being considered. Table B.4 gives the resource use for inspections and related activities mentioned above.

TABLE B.4. RESOURCES ON INSPECTIONS AND RELATED ACTIVITIES

Fiscal Year	90/91	91/92	92/93*	93/94	94/95
Person Months	N/A	1.44	3.15	16.0	5.0
Salaries ($000)		7.8	12.0	60.5	24.0
Operating ($000)		4.1	2.2	8.0	10.0

Source: RPB

2.1.3 Safety Codes.

Safety Codes prepared by the X-Ray Section specify requirements for x-ray equipment, facilities housing it, and for the operation of equipment and facilities. These requirements are mandatory within the federal jurisdiction and have and advisory role elsewhere. As a rule, requirements in individual provinces are harmonized with these Safety Codes.

TABLE B.5. RESOURCES ON SAFETY CODE PREPARATION					
Fiscal Year	90/91	91/92	92/93*	93/94	94/95
Person Months	6.61	5.49	16.35	4.7	6.5
Salaries ($000)	31.6	36.9	62.3	17.8	31.2
Operating ($000)	0.4	12.9	11.5	16.0	2.0

* because of PMRS problems, starting in 1992/93 the planning figures are used Source: RPB

Table B.6 summarizes the results of RPB inspection activities.

TABLE B.6. INSPECTION SUMMARIES				
Fiscal Year	90/91	91/92	92/93	93/94
Medical Equipment (total)	249	148	175	138
compliant	95	81	100	79
problem	107	41	54	59
NEXT*	46	26	14	0
coding error	1	0	7	0
Non-Medical Equipment (total)	198	121	133	105
compliant	167	104	112	74
problem	31	17	21	31
coding error	0	0	0	0
Medical Facility (total)	131	78	102	95
compliant	56	53	55	56
problem	74	25	46	39
coding error	1	0	1	0
Non-Medical Facility (total)	10	1	2	1
compliant	4	1	1	1
problem	6	0	1	0
coding error	0	0	0	0
All Inspections (Grand total)	588	348	412	339
compliant	322	239	268	210
problem	218	83	122	129
NEXT*	46	26	14	0
coding error	2	0	8	0

* NEXT - Nation-wide Evaluation of X-ray Trends - discontinued after 92/93. Source: RPB

2.1.4 Provision of Training.

The X-Ray Section also provide more formal training responsible for x-ray equipment operation under the Treasury Board Standard and Canada Labour Code, and for operators in PEI and Territories. This includes the semi-regular Radiation Safety Courses for the Department of Transport (four to six times a year), and Workshops on Quality Assurance given to operators of medical x-ray equipment in PEI and the Northwest Territories (attended also by operators from the Yukon). Table B.7 lists the resources used on this activity.

TABLE B.7. RESOURCES ON FORMAL RADIATION SAFETY AND QA TRAINING					
Fiscal Year	90/91	91/92	92/93*	93/94	94/95
Person Months	6.46	6.03	8.5	10.8	14.1
Salaries ($000)	30.0	38.0	31.2	40.9	57.6
Operating ($000)	10.4	N/A	5.8	10.4	4.8

* because of PMRS problems, starting in 1992/93 the planning figures are used Source: RPB

2.1.5 X-Ray Section Staff Resources.

The rest of the section's resources has been spent on activities in support of its regulatory and radiation protection mandate, namely on research and data collection, and on administration. Below is an overview of the staff level for the last eleven years, in person year per fiscal year:

TABLE B.8. X-RAY SECTION STAFF RESOURCES											
Fiscal Year	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93[1]	93/94
Profess.	30.50	41.00	48.00	48.00	48.00	48.00	39.90	54.00	52.00	52.00	40.00
TI[2]	42.00	37.50	47.25	48.00	48.00	48.00	48.00	48.00	41.00	46.00	39.00
EL	12.00	11.50	12.00	12.00	12.00	12.00	12.00	10.00	10.00	9.00	12.00
Adm.	12.00	12.00	12.00	17.00	3.00	11.00	14.00	6.00	12.00	12.00	13.00
Student	15.50	20.00	16	16.00	5.00	6.00	0	0	0	3.00	1.00
Total Person Months	112.0	122.0	135.25	141.0	116.0	125.0	113.9	118.0	115.0	122.0	105.0

[1] because of PMRS problems, starting in 1992/93 the planning figures are used Source: RPB
[2] two of TIs work half of the time as technicians for professionals
[3] P. Chaloner - 7 months French training - not shown in Project Reviews
[4] J. Gordon retired Jan. 20, 1993; J. Best started Jan. 7, 1994.
[5] plus office overload personnel

2.2 Non-Ionization Radiation.

This section does not compile information/data in the same format as the X-Ray Section. The major objectives of the section are:

- to identify potential health hazards and assess health risks associated with exposure to electromagnetic fields, light or sound

- to minimize, through the available methods of communication and risk management, unnecessary exposure to these agents when they have been found hazardous

The tools to achieve these objectives are

- research into interaction of non-ionization radiations with biological systems, including human body, and effect on these systems
- risk communication through mass media, educational literature, guidelines and other written material
- regulatory control of devices coming to Canadian market
- provision of radiation safety standards and expert assistance for equipment operated under the Canada Labour Code and Treasury Board Standards

2.2.1 Regulations.

Regulations are in force for six classes of devices emitting non-ionization radiations; the seventh class (lasers) is in the final stages of preparation. It is not meaningful to list regulations/FY data, since the preparation of any particular regulation extends over a number of years, and the intensity of involvement depends on the stage in which the draft is. NIRS does not report the operating cost separately for individual activities. The resources allotted for the preparation and maintenance of regulations are given in Table 9:

TABLE B.9. RESOURCES ON REGULATION DRAFTING AND MAINTENANCE

Fiscal Year	90/91	91/92	92/93	93/94
Person Months	10.32	4.08	6.0	3.6
Salaries ($000)*	51.91	22.32	22.74	13.64

* 90/91 & 91/92 reported salary, 92/93 & 93/94 planning estimates

Source: RPB

2.2.2 Evaluation of Devices.

In support of decisions on regulatory needs, an assessment of risk connected with specific class of devices is carried out when necessary. Table 10, below shows the level of this activity over the last four fiscal years. The number of devices varies substantially from one year to another, reflecting special investigations for a particular regulation. There is no correlation between the number of devices assessed and resources required: in some cases, the assessment consist of processing data supplied by manufacturer, while in other cases it may involve extensive in-house testing.

TABLE B.10. EVALUATION (RISK ASSESSMENT) OF DEVICES FOR REGULATORY PROPOSALS				
Fiscal Year	90/91	91/92	92/93	93/94
Devices assessed	559	79	60	6*
Person Months	7.2	10.8	14.4	4.8
Salaries ($000)**	36.22	50.22	54.58	18.19

* 1993/94 figure includes assessments in progress
** 90/91 & 91/92 reported salary, 92/93 & 93/94 planning estimates

Source: RPB

2.2.3 Device Compliance Evaluation.

Devices subject to RED Regulations are assessed for compliance with these regulations, either by inspection or by submission evaluation. Table B.11 summarizes these actions

TABLE B.11. DEVICE COMPLIANCE EVALUATION				
Fiscal Year	90/91	91/92	92/93	93/94
Detailed evaluation	11	2	1	5*
Routine submission	104	67	82	169
Person Months	7.8	7.2	15.6	8.4
Salaries ($000)**	39.23	33.48	59.12	31.84

* 1993/94 figure includes assessments in progress
** 90/91 & 91/92 reported salary, 92/93 & 93/94 planning estimates

Source: RPB

The section staff also participates in national and international standardization. This activity is included as a part of the more general goal dealing with the provision advice and expert assistance.

2.2.4 Radiation Safety in Federal Departments.

Requirements specified in safety codes, guidelines and recommendations prepared by the NIR Section are generally accepted as mandatory within Federal jurisdiction. Scientists and inspectors from the NIR Section provide expert advice and carry out inspections and tests where required. As a rule, the organization requesting the survey covers the direct operating cost and inspection. The character of hazard and level of known risk does not indicate that regular radiation safety inspection program should be carried out by the NIR Section.

Table B.12 gives the resource use for inspections and related activities mentioned above.

TABLE B.12. RESOURCES ON INSPECTIONS AND RELATED ACTIVITIES				
Fiscal Year	90/91	91/92	92/93	93/94
Devices assessed	114	23	100	127
Routine submission	3	3.6	15.6	18
Person Months	15.09	16.747.2	59.12	68.22
Salaries ($000)*	39.23	33.48	59.12	31.84

* 90/91 & 91/92 reported salary, 92/93 & 93/94 planning estimates

Source: RPB

As in the case of devices assessed in the preparation of regulations, the amount of resources per device varies substantially with the type of device and its location.

2.2.5 Safety Codes and Guidelines.

Resource allocated to the preparation of safety codes and guidelines are shown in the Table B.13. As with the writing of regulatory drafts, the procedure leading the publishing of a safety code takes several years, and it would not be meaningful to specify the number of codes, etc., per year.

TABLE B.13. RESOURCES ON PREPARATION OF SAFETY CODES AND GUIDELINES				
Fiscal Year	90/91	91/92	92/93	93/94
Person Months	3.12	2.4	6	6
Salaries ($000)*	15.69	11.16	22.74	22.74

* 90/91 & 91/92 reported salary, 92/93 & 93/94 planning estimates

Source: RPB

2.2.6 Provision of Advice and Education.

There are several areas where the Non-Ionizing Section is addressing popular concerns about effects of non-ionizing radiations on human health. Only one of them - exposure to ultraviolet radiation - coincides with a real health hazards. In other cases - extremely low frequency magnetic fields, cellular telephones, police radars, video display terminals, airport noise and microwave ovens - there is no proof of actual risk connected with exposure to these devices or agents, but the high degree of public apprehension requires the provision of advice and education, either to make population aware of actual risk and means to reduce it, or to allay unfounded fears.

Table B.14 below shows the level of public interest and the resources devoted to addressing it.

TABLE B.14. PUBLIC INTEREST AND RESOURCES				
Fiscal Year	90/91	91/92	92/93	93/94
Public enquiries	350	287	472	900
Person months-enquiries	25.56	13.2	26.4	24
Person months-literature	3.6	7.2	12	12
Person Months-hearings		6		2.4
Salaries ($000)*	146.67	122.76	145.54	145.54

* 90/91 & 91/92 reported salary, 92/93 & 93/94 planning estimates

Source: RPB

2.2.7 NIR Section Staff Resources.

The rest of the section's resources has been spent on activities in support of its regulatory and radiation protection mandate, namely on research and data collection, and on administration. Below is an overview of the staff level for the last five years, in person months for Fiscal Year.

The Bureau also conducts evaluations/investigations and survey of radiation emitting devices. These differ from inspections because they do not demand a physical inspection. Inspection are usually performed on site.

TABLE B.15. NIR SECTION STAFF RESOURCES					
Fiscal Year	89/90	90/91	91/92	92/93	93/94
Professional		42	49	52	70
Technical Support		36	36	38	36
Administration		12	12	12	[1]
Postdoc. Fellow			12		
Total	115.6[2]	90[3]	109	102	106

[1] secretary shared with X-Ray Section

[2] only the total including Directorate and Bureau overhead is available

[3] students are not reported in NIRS project reviews

Source: RPB

APPENDIX B.1 - DEVICES

X-RAY SECTION DEVICES		
Non-medical X-ray emitting devices	**Medical X-ray emitting devices**	**Hi-tech X-ray devices**
Device classes for which specific RED Regulations exist: - Television receivers (Schedule II, Part I) - Baggage x-ray devices* (Schedule II, Part IV) - Demonstration gas discharge devices (Schedule II, Part V) - Electron microscopes (Schedule II, Part IX) - X-ray diffraction devices* (Schedule II, Part XIV) - Cabinet x-ray devices (Schedule II, Part XV)	Device classes for which specific RED Regulations exist: -Dental X-ray Equipment* including (Schedule II, Part II) Conventional X-ray Equipment Panoramic X-ray Equipment Cephalometric X-Ray equipment - Medical X-ray Equipment* including (Schedule II, Part XII) Stationary X-ray Equipment Mammography X-ray Equipment Mobile X-ray Equipment C-Arm X-ray Equipment Hand-held X-ray Equipment - Photofluorographic X-ray Equipment (Schedule II, Part VI)	- Software Controlled X-ray Equipment - Linear Electron Accelerators - Therapy Simulators - Computed Tomography (RED Regulations and Safety Code in preparation) - Navigation Aids (X-ray emitting vacuum tubes)
Devices not covered by specific regulations, but covered under the general provisions of the RED Act: - Industrial x-ray equipment* - Electron beam welders/processors/irradiators - Thyratrons - Navigation Aids (X-ray emitting vacuum tubes)	Devices not covered by specific regulations, but covered under the general provisions of the RED Act: - Intra-oral Dental X-ray Equipment* - Veterinary X-ray Equipment* - Therapeutic X-ray Equipment (has Safety Code which is considered obsolete) - X-ray Therapy Simulator - X-ray Bone Densitometer	
	Devices not under R.E.D. Act jurisdiction, for which the X-Ray Section has responsibility under the Food and Drugs Act: - Radio-isotope Based Bone Densitometer - Brachy-therapy Equipment - Positron Emission Tomography Equipment	
	Not devices but falling under X-Ray Section's responsibility: - Protection against occupational exposure to X-rays - Population exposure to X-rays	

X-RAY SECTION DEVICES		
Non-medical X-ray emitting devices	**Medical X-ray emitting devices**	**Hi-tech X-ray devices**
	Isotope-based radiation therapy equipment: - Cobalt Teletherapy - Cesium Teletherapy	

* Safety code available for this class

Source: RPB

NON-IONIZING RADIATION SECTION DEVICES		
Acoustics - Devices and Radiation	**Electro-Optics - Devices and Radiation**	**Electromagnetics - devices and fields**
Ultrasound: Device classes for which specific RED Regulations exist: - Ultrasound physical therapy equipment (Schedule II, Part XIII) Device classes for which regulations are proposed or being developed: - diagnostic ultrasound scanners - extracorporeal shock wave lithotripters Devices not covered by specific regulations, but covered under the general provisions of the RED Act: - Medical Ultrasound Devices* diagnostic ultrasound scanners extracorporeal shock wave lithotripters ultrasound ablation devices (tumour treatment) ultrasound hyperthermia devices (tumour treatment) dental ultrasonic scalers - Consumer Ultrasound Devices* ultrasonic bathtubs ultrasonic personnel detectors (alarms and control systems) VDTs ultrasonic dog repealers ultrasonic pest control - Industrial Ultrasound Devices* ultrasonic cleaner ultrasonic welder ultrasonic drill ultrasonic emulsifier	Ultraviolet and visible: Medical: - Diagnostic dermatology - Sunlamps (Schedule II, Part XI) - Physiotherapy - Chemo-phototherapy Non-Medical - Industrial Polymerizer curing lamps - Black light - Fluorescent lamps - Photocopiers - Sterilizers - Search lamps - Projection lamps - Quartz halogen lamps - Flashing lamps - Arc welding - Electronic flash - Stroboscopic lights - Environmental ultraviolet and sunlight - Ultraviolet dental polymerizers (Guidelines) - Mercury vapour/metal halide lamps(Schedule II, Part X) INFRARED: - Radiative heating Industrial paint drying food warming infant warmers) - Heat guns - Solar simulators - Arc welding - Glass blowing - Melting furnaces - Industrial material processing	1. Microwave Ovens (Schedule II, Part III) 2. Short -Wave Diathermy (medical), Safety Code 25, 83-EHD-98 3. Microwave Diathermy (medical) 4. Induction Heaters, Report 85-EHD-120 5. Radiofrequency Heaters, Report 80-EHD-47 6. Video Display Terminals, Report 83-EHD-91 7. Magnetic Resonance Clinical Systems, Safety Code 26, 87-EHD-127 8. Active Metal Detectors, Safety Code 18, RPB-SC-18 9. Portable and Mobile Radios, (Cellular Telephones, Walkie-talkies, Cordless Telephones, etc.) 10. 60 Hz Power Lines 11. Radars, (Police Hand-Held Units, Air Traffic Control, Navigation, etc.) 12. Broadcast Transmitters 13. Radio Navigation Systems 14. Industrial Welders 15. Microwave Blood Warmers 17. Domestic RF Food Warmers 18. RF Electrosurgical Devices (medical) 19. House-Hold Electrical Appliances 20. Magnetic Resonance Imaging Equipment (medical)

NON-IONIZING RADIATION SECTION DEVICES		
Acoustics - Devices and Radiation	**Electro-Optics - Devices and Radiation**	**Electromagnetics - devices and fields**
Noise Health Effects of Environmental Noise (EARP Guidelines or CEAA draft legislation), covering: - Low flying military aircraft - High speed Rail - Aircraft in vicinity of airports Proposed guidelines for assessment and control for: - Aircraft in vicinity of airports Existing Regulation (not RED Act): - Toys (advice to Product Safety Bureau re excess risk of noise induced hearing loss to children, for amendments to Hazardous Products Act and Toy Regulations) Devices not covered by specific regulations, but covered under the general provisions of the RED Act: Consumer Devices - personal cassette players Industrial Devices (RED Regulations proposed) - rotating electrical machinery - pneumatic compressors - tools or machines - power tools (specific examples are motors, pumps, fans, chain saws, drills etc.,) Medical Device: - fetal vibro-acoustic stimulator Proposed Safety Code: - industrial noisy machinery (devices)	Medical Lasers - Surgery - Aesthetic treatment units (birth marks removal) - Dental drilling - Gum treatment - Keratotomy (corneal carving, aesthetic and surgical) - Intra-ocular lens corrective treatment - Retinal coagulators - Retinal surgery - Physiotherapy treatment - Cosmetic treatment - Acupuncture treatment - Oncological photoradiation therapy (lung cancer) - Cellular tracking and destruction Non-Medical Lasers - Photolysis - Spectroscopy - Educational demonstration lasers (Schedule II, Part XIII) - Metrology - Inspection and quality control - Land surveying - Topology (automatic 3D measurement) - Forensic (fingerprint detection system) - Scribing and printing - Plate makers - Material processing (heat treating, photo-etching) - Precision Tooling (drilling, welding, soldering, cutting, sealing, trimming) - Doppler velocimeters - Vibration analysis - Nephelometry (concentration transmittance measurement) - Anemometry (fluid velocity measurement) - Interference pattern analysis - Holography - Lidar (laser radar) - Range finders - Weapon simulators - Target designators - Cloud ceilometers - Optical fibre communications - Atmospheric communications - Microscopes - Point of sale scanners and code scanners (Schedule II, Part VII) - Printers - Audio and video disk players - Computer optical data storage - Entertainment - Light shows (Guidelines) - Thermonuclear fusion	

* Safety Code exists for this device

Source: RPB

APPENDIX B.2 - EXPOSURE DATA

Representative Chest X-Ray Skin Entrance Exposures by Location and Year in mR - Small Facilities in Remote Areas.

Location\Year	75	82	83	86	87	88	90-93	94
Arctic Bay	39						6.5	9.0
Resolute Bay	45		33				8.6	8.8
Pond Inlet	40		56				13.3	7.46
Pangnirtung	55						8.0	10.5
Nanisivik			16				11	7
Igloolik	42		21	18.5			11	5.3
Grise Fiord	15						7.8	8
Broughton Island	35			23			7.5	11
Baker Lake	33	40					4.4	
Chesterfield Inlet	94				6		5.2	
Cape Dorset							7.6	5.1
Lake Harbour							6.7	4.9
Hall Beach							11	9.4
Cat Lake					8			6.4
Fort Hope						11		5.4
Kasabonika			9			23		10.9
New Osnaburg						23		18.3
S.L. Zone Hospital						11.1		8
Webequie						48		10.9

Representative Chest X-Ray Skin Entrance Exposures by Location and Year in mR - Small Facilities in Remote Areas.								
Black Lake								3.7
Wallaston Lake								5
Matsqui Institution								8
Kent Institution								7.7
Coral Harbour							6.8	
Rankin Inlet	8.7				6		4.6	
Sanikiluaq	7.5						4.4	
Whale Cove							6.9	
H.H. Williams Hosp.	64						4.4	
Fort Liard							6.5	
Fort Providence	38						2.5	
Fort Resolution							2.8	
Fort Smith							5	
Fort Wrigley	61	26					3	
Fort Rae							1.9	
Snowdrift	40						2.9	
Saddle Lake								19.4
Fox Lake	9				15			13.4
Fort Chipewyan	11							6.7
Hobbema								8.5
Edmonton Institution								17.2
Warkworth Inst.								17.3
Etabl. Leclerc								13
Ste. Anne Hosp								9.6
Parhelion Clinic								10.5

Representative Chest X-Ray Skin Entrance Exposures by Location and Year in mR - Small Facilities in Remote Areas.								
NO. OF SURVEYS	17	2	5	2	4	5	25	30
AVERAGE	35.13	33.0	27.0	20.75	8.75	23.22	6.41	9.55

Notes:

Data for chest x-rays were chosen because this is one of the few examinations allowed at small facilities and if the chest dose is reduced, the dose for other examinations in this type of facility falls correspondingly.

Though there are exceptions, the patient doses decreased substantially during the time X-Ray Section has been providing radiation safety surveillance in installations in remote areas, under the Treasury Board Standard and Canada Labour Code.

For reporting purposes, the table could be summarized by presenting data in four groups: 1975, 1988-88, 1990-93, and 1994, as follows:

Period	1975	1982-88	1990-93	1994
No. of Surveys	17	18	25	30
Average Exposure	35.13	21.87	6.41	9.55

The apparent increase from 1990-93 to 1994 period is a statistical fluctuation from the random selection of facilities for the sample.

Current low figures are a result of a combination of contributing factors outlined below:

Technology

Following recommendations of RPB inspection staff:

Very old x-ray machines have been replaced

Slow speed intensifying screens and films have been replaced with faster rare earth systems

Facilities have been upgraded to meet SC-20A requirements

Human Factors

On site inspections have allowed inspectors:

to provide an accurate assessment of the status of the x-ray facility to the user and owner, and

to give in-service education to x-ray operators on setting correct loading factors, proper patient positioning and film processing.

Quality Assurance

To maintain satisfactory level achieved in most installations, the X-Ray Section has developed, produced and distributed 250 quality control tools for small x-ray facilities operated under the federal jurisdiction and in Indian reserves. The Section's inspectors have been providing instructions on the use of quality control and good practices in radiation protection to operators of these facilities to ensure that technological advances are indeed utilised to improve the safety and performance of x-ray equipment under its responsibility. However, there is still room for improvement and work to be done.

WORKING DOCUMENT C: PRIORITY SUBSTANCE LIST ASSESSMENT REPORTS SUMMARY

Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading Department	Paragraph 11(a)	11(b)	11(c)		
1	**1,1,1-Trichloroethane** Covered under other regulations. No assessment conducted	Environment	NAC	NAC	NAC	Covered under other regulations. No assessment conducted	Covered under other regulations.
2	**1,1,2,2-Tetrachloroethane** This substance is released to the atmosphere in relatively low amounts in Canada. Currently, it is not produced in and not longer imported into Canada. Source: Enters the environment as a by-product in air emissions from the incineration of wastes generated during the production of vinyl chloride monomer (VCM) and ethylene dichloride (EDC).	Environment	UTA	NT	UTA	Human populations. No adequate epidemiological studies have been identified in which the carcinogenicity of this substance in humans has been investigated. Wildlife/other populations. The incidence of hepatocellular carcinomas was significantly increased in laboratory mice. However, the evidence of carcinogenicity in animal species is limited.	Additional data/studies required. Priority: Low **This substance was identified in the Board of Review request list.**

Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading Department	Paragraph 11(a)	11(b)	11(c)		
3	**1,2-Dichlorobenzene** This substance is present in low concentrations and has a short half-life in the atmosphere. It is produced in and imported into Canada. Source: This substance is used as a solvent for carbon removal, degreasing of engines, and metal cleaning. It is found in industrial and municipal effluent, surface water and sediments in Canada. It is not persistent in air or surface water.	Health	UTA	NT	NT	Human populations. Not at risk. Wildlife/other populations. Not at risk.	Additional data/studies required. Priority: High

Paragraph 11 (a), (b) and (c) of the CEPA reads:
11 (a) "having or may have an immediate or long-term harmful effect on the environment"
11 (b) "constituting or that may constitute a danger to the environment on which human life depends on"
11 (c) "constituting or that may constitute a danger in Canada to human life or health"

T = toxic; NT = non-toxic; UTA = unable to assess; NAC = no assessment conducted.

Priority Substances List Assessment Reports Summary							
No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading Department	Paragraph 11(a)	11(b)	11(c)		
4	**1,2-Dichloroethane** This substance occurs in concentrations that represent a danger to human health/life. It is produced in Canada and it is also exported to other countries. Source: This substance is used as an intermediate in the synthesis of vinyl chloride and, in small quantities, in the manufacture of motor antiknock fluids for export. Enters the air during its production and during the production of VCM. Other sources include industry effluent, effluent from the treatment of contaminated ground water, air emissions and leachate from waste disposal sites and long-range atmospheric transport from other countries.	Environment	NT	NT	T	Human populations. Classified as "probably carcinogenic to humans" Not adequate investigations of potential carcinogenicity of this substance in exposed humans populations have been identified. Study results suggest that colon and rectal cancer incidence may be elevated in populations consuming water from wells subject to anthropogenic contamination (with this and other substances). Wildlife/other populations. This substance is teratogenic to both freshwater and marine organisms. Found carcinogenic in two species of laboratory animals.	Additional data/studies required. Priority: Medium

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No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading Department	Paragraph 11(a)	11(b)	11(c)		
5	**1,4-Dichlorobenzene** This substance is present in low concentrations and has a short half-life in the atmosphere. It is produced in and imported into Canada. Source: It is used as an air freshener, as a deodorizer in urinals, and as a moth and bird repellent. It is found in industrial and municipal effluent, ambient and indoor air ground and surface water, sediment and biota. It is not persistent in air or surface water.	Health	UTA	NT	NT	Human populations. Not at risk. Wildlife/other populations. Not at risk.	Additional data/studies required. Priority: n/a **This substance was identified in the Board of Review request list.**
6	**3,3'-Dichlorobenzidine** This substance may constitute a danger to human life/health. It is imported into Canada. Source: It is used in the production of pigments for printing inks textiles, paints, plastics and crayons. It is expected to occur in association with its industrial activity, it is not persistent in the environment.	Health	NT	NT	T	Human populations. It is classified as "probably carcinogenic to humans". Available information is considered inadequate to assess carcinogenicity in humans. Wildlife/other populations. It causes cancer in a number of animal species. It was found to be carcinogenic to rats, mice, dogs and possibly hamsters.	Additional data/studies required. Priority: Low

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		Leading Department	Paragraph 11(a)	11(b)	11(c)		
7	**3,5-Dimethylaniline** It is expected to be low to moderate volatility and readily to photolyze in air, it does not persist in the environment. No information was found in the literature on the concentrations of this substance in air, surface waters, groundwater, biota, soil or sediment in Canada or elsewhere. Source: It is mainly used as an intermediate in the manufacture of azo dyes. It is not produced in or imported into Canada.	Health	NT	NT	UTA	Human populations. The available information was considered inadequate to estimate the exposure to this substance by the general Canadian population or the associated potential risk. Wildlife/other populations. Limited availability of data. Given the low concentrations and lack of use of this substance adverse effects on wildlife populations and other animal population is unlikely. It is also unlikely that this substance will contribute to ozone depletion, global warming or the formation of ground-level ozone.	(Gazette summary did not include recommendation of the assessment report, this report was not made available) Priority: n/a **This substance was identified in the Board of Review request list.**
8	**Aniline** This substance is present in low concentrations in the atmosphere. It is imported into Canada. Source: It is used as an intermediate in the production of chemicals for the synthesis of rubber and polymers. It is expected to occur in association with its industrial activity, it is not persistent in the environment.	Health	NT	NT	UTA	Human populations. Available information is considered insufficient to assess exposure of the general population. Wildlife/other populations. Information on the toxicity of aniline to wildlife was not identified. Because of the predicted low accumulation and toxicity of aniline, adverse effects on aquatic wildlife was considered unlikely.	Additional data/studies required. Priority: Low **This substance was identified in the Board of Review request list.**

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		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
9	**Arsenic and its Compounds** The highest concentrations of this substance occur near active and abandoned gold- and base-metal mining and ore processing facilities, and in areas affected by the use of arsenical pesticides. Source: Arsenic is present in the aquatic and terrestrial environments because of natural weathering and erosion of rock and soil, and human activities (including gold-and base-metal processing, the use of arsenical pesticides, coal-fired power generation and the disposal of domestic and industrial waste materials). Canadians are exposed to inorganic arsenic in food, drinking water, soil and ambient air.	Health	T	NT	T	Human populations. Inorganic Arsenic causes cancer in humans exposed by both inhalation and ingestion. Wildlife/other populations. Concentrations of Arsenic near gold-mining areas in Canada are high enough to cause, or have the potential to cause, adverse effects in a variety of aquatic and terrestrial organisms.	Additional data/studies required. Priority: Low

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Priority Substances List Assessment Reports Summary

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		Leading Department	Paragraph 11(a)	11(b)	11(c)		
10	**Benzene** Benzene does not persist in water or soil because it biodegrades and volatilizes rapidly to the atmosphere. It also does not persist in the atmosphere because it undergoes rapid photo-oxidation. It is produced in and imported into Canada. Source: Vehicle emissions are the major source of benzene release to the environment. Cigarette smoke is a major source of benzene in indoor air. Benzene is an organic compound found naturally in the environment in low concentrations. It is produced commercially from petroleum, natural gas condensates, or coal. It is used in industry as a volatile solvent and as an intermediate in the production of many chemicals including ethylbenzene.	Environment	NT	NT	T	Human populations. It is classified as "carcinogenic to man". Associations between leukaemia and exposure to benzene in occupationally exposed populations have been observed in numerous case and epidemiological studies. Wildlife/other populations. Benzene was found not highly toxic to mammals exposed by inhalation or ingestion. No field studies on wild species were available at the time the assessment was conducted. Data on the effects resulting from chronic exposure are not available.	Additional data/studies required. Priority: High, medium and low

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		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
11	**Benzidine** No conclusive data on the environmental release of benzidine in Canada were identified. Currently, it does not appear to be produced in or imported into Canada. Source: It is used as an intermediate in the production of dyes and pigments. It can enter the environment from any stage of production, storage, transport, use and disposal of benzidine itself or benzidine containing materials, or possibly by atmospheric and water-borne transport from other countries.	Health	NT	NT	T	Human populations. It is classified as "carcinogenic to man". Occurrence of bladder cancer in workers in Japan, Germany, Switzerland, Italy, England, France and the United States who had been occupationally exposed to benzidine has been reported. Wildlife/other populations. Benzidine is carcinogenic to a number of animal species. Hepatocellular, liver and other tumours were observed in mice exposed to benzidine. No data on the toxicity of benzidine to wild populations were identified.	Additional data/studies required. Priority: Low

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		Leading Department	Paragraph 11(a)	11(b)	11(c)		
12	**Bis (2-Chloroethyl) Ether** (BCEE) This substance has a low rate of release and short persistence in the atmosphere. Currently, it is not produced in or imported into Canada. Source: This organic compound can be formed as a by-product in some industrial processes. Between 1984 and 1986, BCEE was used in Canada as either a fragrance, perfume, deodorizer, or flavouring agent. In the USA is used as an intermediate reactant in the synthesis of the methyldithiocarbamic acid fungicide commonly known as metam-sodium. BCEE enters the Canadian environment as a by-product from chlorination of waste streams containing ethylene or propylene.	Environment	NT	NT	UTA	Human populations. Information on the effects in humans is restricted to case reports in a few individuals and one clinical study. Exposure to inhalation to BCEE caused extreme irritation to the eyes and nasal passages. Epidemiological data on the effects of chronic exposure to BCEE on human health were not identified. Wildlife/other populations. No relevant data were available to assess toxicity to wildlife. BCEE is acutely toxic following inhalation, oral or dermal exposure. Some investigations on the carcinogenicity of BCEE on laboratory animals (mice) have found evidence of an increase in liver tumour incidence.	Additional data/studies required **Priority.** Low

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		Leading Department	Paragraph 11(a)	11(b)	11(c)		
13	**Bis (2-Chloromethyl) Ether (BCME)** No data on levels of BCME in the Canadian environment or in industrial effluent were identified. Sources: BCME can be formed as a by-product when formaldehyde reacts with chloride ions in an acidic medium.	Environment	NT	NT	T	Human populations: BCME has been classified as "Carcinogenic to Humans" Lung cancer has been reported in workers exposed to BCME. There have been a number of studies of populations exposed to BCME. Wildlife/other populations: BCME was found acutely toxic following inhalation, oral or dermal exposure. Long-term exposure of male mice marked a reduction in survival and increased of pulmonary tumours (adenomas). No studies were found that investigate the toxicity of BCME to aquatic or terrestrial organisms. No information on the effects of BCME on the ozone layer or global warming was found. In view of their relative short atmospheric lifetime, however, effects of these substances on the ozone layer or global warming are not anticipated.	No recommendations were made in this assessment.

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		Leading Department	Paragraph 11(a)	11(b)	11(c)		
14	**Bis(2-ethylhexyl) Phthalate or (DEHP)** Data on the concentrations of DEHP in the Canadian environment were found limited. DEHP is produced in and imported into Canada. Source: Releases of DEHP into the atmosphere include emissions during the manufacture and use of these substances and through the incomplete combustion of plastic material, it is also found in municipal and industry wastewater, soil, consumer products and food. It is used as a plasticizer in polyvinyl Chloride (PVC), nitrile-butadiene rubber and miscellaneous applications (children toys).	Environment	UTA	NT	T	Human populations. Classified as "possibly carcinogenic to humans". The major pathway exposure to DEHP for the general population is from the ingestion of food. The potential carcinogenicity of DEHP in human populations has not been examined in epidemiological studies. Wildlife/other populations. In the most extensive bioassays in experimental animals conducted today, DEHP was found carcinogenic in both rats and mice, increasing the incidence of benign and malignant hepatic tumours. No adequate information was identified concerning concentrations of DEHP in biota or in environmental media to estimate the exposure of terrestrial plans or wildlife to the substance. This substance is rapidly remove from the atmosphere by photo-oxidation and will not persist in the troposphere.	Several data gaps were identified that limited the assessment of the environmental and human health effects of DEHP. Ten recommendations for further studies in level of concentration; toxicity tests; teratogenicity; neurotoxicity and immunotoxicity; cardiotoxicity; epidemiological studies of developmental, reproductive, and carcinogenic effects; and the daily intake of the Canadian population be conducted. Priority: High

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		Leading Department	Paragraph 11(a)	11(b)	11(c)		
15	**Cadmium** This assessment focuses on the forms of cadmium which are to be known to be found in the environment. Cadmium is present in the Canadian environment as a result of both natural processes (including forest fires, volcanic emissions and weathering of soil, till and bedrock) and human activities. It is produce in and imported into Canada. Source: Anthropogenic sources of cadmium entry to the Canadian environment include metal production, stationary fuel combustion, transportation, solid waste disposal, and sewage sludge application.	Environment	T	NT	T	Human populations. In several studies of workers, exposure to airborne cadmium compounds has been associated with increased mortality from lung cancer but the increase may have been due, in part, to concurrent exposure to arsenic. However, on the basis principally of results of inhalation studies in animal species, inorganic cadmium compounds have been classified as "probably carcinogenic to humans". In addition, renal tubular dysfunction has been observed in human populations to cadmium in the workplace or in the environment. While these effects were originally reported in populations with relatively high exposure to cadmium, in recent European studies, mild effects on the kidney have been associated with levels of cadmium at or near those to which a portion of the Canadian general population is exposed. Wildlife/other populations. Concentration of cadmium have adverse effects on aquatic biota. Renal dysfunction has been observed in some animal species. Inorganic cadmium compounds are not persistent and are not expected to contribute to global climate change, or contribute to stratospheric ozone depletion.	Additional data/studies required. Priority: High, medium and low

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		Leading Department	Paragraph 11(a)	11(b)	11(c)		
16	**Chlorinated Paraffin (CP) Waxes** short chain (SCCPs) medium and long chain (MCCPs & LCCPs) No data were identified on the concentrations of these substances in the Canadian environment. The term "chlorinated paraffin waxes" is generally restricted to chlorinated paraffins having long carbon chains. However, the scope of this assessment was broadened to include the short chain and medium chain chlorinated paraffins which are also concern because of their potential effects on the environment and human health. CPs are produced in and imported into Canada. Source: CPs are used as plasticizers and flame retardants as well as extreme-pressure additives in lubricating oils. They are persistent compounds and have the potential to bioaccumulate in aquatic organisms.	Environment	UTA UTA	NT NT	T UTA	Human populations. SCCPs are classified as "probably carcinogenic to humans". Relevant data on SCCPs for humans are not available. MCCPs and LCCPs have been classified as "unclassifiable with respect to carcinogenicity in humans". There is lack of information on concentrations of medium and long chain chlorinated paraffins in environmental media to which humans and other biota are exposed. Wildlife/other populations. Short chain chlorinated paraffins (STCPs) cause adverse effects in fish and aquatic invertebrates. However, owing to the lack of information on concentrations of this substances in the Canadian environment, it is not possible to estimate exposure of Canadian biota or to compare this exposure with levels estimated to cause adverse effects. STCPs have caused cancer in experimental animals. None of the chlorinated paraffins is volatile. These substances are not expected to contribute significantly to depletion of stratospheric ozone or global warming.	Five recommendations: R1: complete toxicity assessment, data required in the aquatic environment; R2: characterization of the releases of CPs from industrial sources; R3: development of suitable analytical methods (exposure of humans) is required; R4: carcinogenicity bioassay and additional data on neurotoxicity and immunotoxicity are desirable; R5: additional research by which SCCPs induce tumours Priority: high (R1 & R2); medium (R3,R4 & R5)

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		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
17	**Chlorinated Wastewater Effluents (CWWE)** CWWE is defined to include only those effluents to which chlorine or chlorination agents are added for disinfection or for biofouling. Residual chlorine and halogenated organics have been identified in effluents and receiving waters from municipal wastewater treatment plants, power generating stations, and several industries in Canada. Source: CWWEs are widely used as bleaching agents, disinfectants in water purification and treatment, and inhibitors of biofouling in cooling waters. There are two major sources of CWWE in Canada : (1) effluents from municipal wastewater treatment plants (MWTPs) and from industrial plants treated with chlorine products for disinfection, and (2) cooling waters from power plants and industrial plants treated with chlorine products to control biofouling.	Environment	T	NAC	NAC	Human populations. There is not sufficient information to estimate the exposure of humans to CWWE or their products. Wildlife/other populations. Laboratory tests with whole effluent samples demonstrated that CWWE from MWTPs were acutely lethal to fish and invertebrate species. Information on the effects of CWWE to the environment on which human life depends was not identified.	*In situ* testing and biological surveys near power stations and industrial outfalls are recommended to assess the potential for harmful effects from CWWE. Priority: medium

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		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
18	**Chlorobenzene or Monochlorobenzene (MCB)** MCB concentration are low in the Canadian environment, MCB is included in the group of substances termed "volatile organic compounds". It is imported into Canada. Source: It is used as a carrier solvent for pesticides, MCB direct release into the soil represent the largest single source of release of MCB to the Canadian environment. Another potential source identified, but not confirmed in Canada, is emissions from waste incinerators.	Health	NT	NT	NT	Human populations. Although effects on the nervous system, neonatal development and skin have been reported in occupationally-exposed populations, available studies are considered inadequate for assessing potential risks associated with the exposure to MCB due to methodological weaknesses. Based on the increased incidence of hepatic neoplastic nodules in rats in a carcinogenesis bioassay, MCB is classified as "possible carcinogenic to humans". The derived Tolerable Daily Intake (TDI) for this classification on the basis of the results by the most appropriate route of exposure (inhalation) considered MCB not "toxic" to human life/health (based on limited data available). Wildlife/other populations. MCB has induced chromosomal aberrations in plants and bacteria. Neither acute nor chronic studies were found for wildlife. However, the effect levels reported in inhalation studies in laboratory animals are considered relevant to wild mammals. MCB was found acutely toxic following administration by all routes of exposure (i.e., dermal, oral, intraperitoneal). Because of its short persistence in the atmosphere, and relatively low levels of release, MCB can not be associated with ozone layer depletion. Similarly, the magnitude of potential effects on global warming and photochemical smog formation is not	Additional data on the fate and toxicity of MCB in soil and the exposure of the Canadian population is desirable to permit a more complete assessment. Priority: Low

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		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
19	**Chloromethyl Methyl Ether (CMME)** No data on levels of CMME in the Canadian environment or in industrial effluent were identified. Sources: Information showing that CMME can be formed as a by-product during production was not found.	Environment	NT	NT	T	Human populations: CMME has been classified as "Carcinogenic to Humans" Lung cancer has been reported in workers exposed to CMME. There have been a number of studies of populations exposed to CMME. Wildlife/other populations: CMME was found acutely toxic following inhalation, oral or dermal exposure. Long-term exposure of male mice marked a reduction in survival and increased of pulmonary tumours (adenomas). No studies were found that investigate the toxicity of CMME to aquatic or terrestrial organisms. No information on the effects of CMME on the ozone layer or global warming was found. In view of their relative short atmospheric lifetime, however, effects of these substances on the ozone layer or global warming are not anticipated.	No recommendations were made in this assessment.

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		Leading Department	Paragraph 11(a)	11(b)	11(c)		
20	**Chromium and its Compounds** This substance is naturally present in the Canadian environment in a trivalent or hexavalent forms. Currently, it is imported into Canada. Source: It is used in a wide variety of industrial applications in Canada including the production of stainless and heat-resistant steels, refractory products such as bricks and mortars, and in pigments, metal finishing, leather tanning, and wood preservatives. Both trivalent and hexavalent forms are release into the environment as a result of these industrial uses as well as from the production and combustion of fossil fuels, and the smelting and refining of nonferrous metals.	Environment	T	NT	T in 1 form	Human populations. Based on the weight of evidence of carcinogenicity in occupationally exposed population, the group of hexavalent chromium is classified as "carcinogenic to humans". Wildlife/other populations. Hexavalent chromium is reported to harm some plants and microbial communities. Chromium occurs in low concentrations in the atmosphere and it is unlikely to have a marked influence on the earth's solar radiation balance and is not expected to contribute to global warming or depletion of stratospheric ozone.	Further data/studies are recommended to have a complete assessment of this substance. Priority: high

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		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
21	**Creosote-Impregnated Waste Materials (CIWM)** Creosote is composed of hundreds of compounds, the largest group being the polycyclic aromatic hydrocarbons (PAHs). CIWM includes creosote waste products and creosote-contaminated sites. Groundwater has been severely contaminated with PAHs at several Canadian sites. Large amounts of waste creosote have been discovered in soil, groundwater, and some surface waters. Source: It is used as a heavy-duty wood preservative for railways ties, bridge timbers, pilings, and large-sized lumber. Railway ties constitute the largest number of CIMW generated in Canada	Environment	T in 1 form	NAC	NAC	Human populations. Available information is considered insufficient to assess exposure of the general population. Wildlife/other populations. Benthic organisms and the general health of aquatic ecosystem near a major wood-treatment facility in Thunder Bay, Ontario have been adversely affected by the presence of waste creosote. There are strong correlations between the presence of PAHs sources in the sediments of several rivers in the USA, and the levels of PAHs found in the tissues of fish, liver tumours have been discovered in these fish. Information was not identified on the effects of CIWM to the environment upon which human life depends.	Further studies are recommended to assess whether CIMW from creosote waste products are "toxic". Priority: medium

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No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading Department	Paragraph 11(a)	11(b)	11(c)		
22	**Dibutyl Phthalate (DP)** It is not expected to be persistent in air and water, but may be more persistent in sediments and soil. Currently, it is imported into Canada. Source: It is used mainly as a plasticizer in polyvinyl emulsions and is released directly to the atmosphere.	Environment	NT	NT	NT	Human populations. The tolerable daily intake is the intake to which it is believed a person can be exposed daily over a lifetime without adverse effects. Wildlife/other populations. No toxicological data were identified for sediment-dwelling biota in Canada. However, exposure to this those biota is considered minimal. This substance is not expected to have a marked influence on the earth's solar radiation balance nor to contribute to global warming or depletion of stratospheric ozone.	Several data gaps were identified that limited the assessment of the environmental effects of this substance. And to permit a more complete assessment of these effects and of the exposure of the general population additional data/studies are recommended. Priority: High

Paragraph 11 (a), (b) and (c) of the CEPA reads:
11 (a) "having or may have an immediate or long-term harmful effect on the environment"
11 (b) "constituting or that may constitute a danger to the environment on which human life depends on"
11 (c) "constituting or that may constitute a danger in Canada to human life or health"

T = toxic; NT = non-toxic; UTA = unable to assess; NAC = no assessment conducted.

Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
23	**Dichloromethane** This substance has a relatively short half-life and is present in low concentrations in the atmosphere. It has been measure in indoor air, outdoor air, and surface waters across Canada. It has also been detected in groundwaters in several provinces, often as a result of its disposal from landfills or waste disposal sites. It is imported into Canada. Source: It is used as a paint removal, as a blowing agent in foam production, and as a component in aerosols and is released primarily into the atmosphere.	Health	T	NT	T	Human populations. Based on extensive bioassays in animal species, this substance has been classified as "probably carcinogenic to humans". However, there is not consistent evidence in epidemiological studies conducted to date on the carcinogenicity associated with occupational exposure to this substance. Wildlife/other populations. The acute and chronic toxicity of this substance in aquatic species has been investigated in numerous studies. The few identified studies on the effects of this substance on aquatic plants were considered inadequate. Data on the effects of this substance in birds and terrestrial plants were limited. This substance is not expected to have a marked influence on the earth's solar radiation balance nor to contribute to global warming or depletion of stratospheric ozone.	Several data gaps were identified that limited the assessment of the environmental effects of this substance. And to permit a more complete assessment of these effects and of the exposure of the general population additional data/studies are recommended. Priority: High and moderate.

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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11 (b) "constituting or that may constitute a danger to the environment on which human life depends on"
11 (c) "constituting or that may constitute a danger in Canada to human life or health"

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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
24	**Di-n-octyl Phthalate** This substance is not persistent in air or surface water, but may persist and accumulate in sediment under anaerobic conditions. It has been detected in industrial effluents and sewage sludge in Canada, and less frequently in surface waters and sediments. It is imported into Canada. Source: It is used as a plasticizer to impart flexibility to polymers, particularly PCV used to make products such as gloves, flooring, and flexible sheets. Information specifically related to the release of this substance to the Canadian environment is limited.	Environment	NT	NT	UTA	Human populations. Available information is considered insufficient to assess exposure of the general population.. Wildlife/other populations. Although no data were identified on the toxicity of this substance to wildlife and benthic organisms, it is considered that, on the basis of its limited use, exposure of these organisms is unlikely to result in harmful effects. This substance is not expected to have a marked influence on the earth's solar radiation balance nor to contribute to global warming or depletion of stratospheric ozone.	Additional data is required to assess the environmental effects of this substance. And to permit a more complete assessment of these effects and of the exposure of the general population. Priority: Low. **This substance was identified in the Board of Review request list.**
25	**Effluent from Pulp Mills Using Bleaching** Many of these chlorinated compounds are persistent and have been detected in water, sediments and biota from bleached pulp mills outfalls.	Environment	T	UTA	NAC	Human populations. n/a. Wildlife/other populations. Canadian bleached pulp mills discharge effluents that are acutely lethal to fish. Chronic effects, such as reproductive anomalies, biochemical changes, and behavioral alterations in aquatic organisms, have been observed in Canadian field studies. This substance is not expected to have a marked influence on the earth's solar radiation balance nor to contribute to global warming or depletion of stratospheric ozone.	n/a

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading Department	Paragraph 11(a)	11(b)	11(c)		
26	**Hexachlorobenzene (HCB)** HCB is persistent substance that has been distributed to all regions of Canada, primarily through long-range transport and deposition. As a result, HCB has frequently been detected in the various media to which humans and other organisms in Canada may be exposed. The highest concentrations of HCB have been observed near point sources in the Great Lakes and connecting channels. Source: HCB has not been used commercially in Canada since 1972, although it is released to the Canadian environment in small quantities as a by-product from the manufacture and use of chlorinated solvents and pesticides, through long-range transport and deposition, and in emissions from incinerators and other industrial processes.	Health	T	NT	T	Human populations. Based on several studies in experimental, this substance is classified as "probably carcinogenic to humans". Available information are inadequate to determine whether HCB causes cancer in humans. Wildlife/other populations. Current levels of air, water and forage fish from the Great Lakes with highest concentrations of HCB have the potential to cause harmful effects to fish-eating mammals, such as mink. The available data on current levels further indicate that HCB has the potential to cause reproductive impairment to predatory bird species across Canada, including the endangered peregrine falcon. This substance is not expected to have a marked influence on the earth's solar radiation balance nor to contribute to global warming or depletion of stratospheric ozone.	Additional data/studies are required to fill out the data gaps identified in the assessment study. Priority: Low.

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading Department	Paragraph 11(a)	11(b)	11(c)		
27	**Inorganic Fluorides** Inorganic fluorides have been measured in ambient air, freshwater, seawater, aquatic sediments, soil, and biota throughout Canada, as a result of both natural an anthropogenic sources. Source: They are used in Canada and emitted into the Canadian environment both from anthropogenic and natural sources. The main anthropogenic sources include phosphate fertilizer production, chemical production, and aluminum smelting. They are released in the Canadian environment to the air, water and land. Gaseous inorganic fluorides (e.g., hydrogen fluoride and sulphur hexafluoride) are primarily released into the atmosphere, whereas particulate compounds (e.g., sodium fluoride and calcium fluoride) are released into aquatic and terrestrial environments.	Health	T	UTA	NT	Human populations. Based on available data, it was concluded that this substance is non "toxic" to humans. Studies regarding the carcinogenicity of fluoride in humans have considerable limitations. Wildlife/other populations. The levels of fluoride in vegetation near certain industrial sources are similar to those that may induce adverse effects in sensitive wildlife populations. Due to lack of data is not possible to determine their influence on the earth's solar radiation balance or their contribution to global warming or depletion of stratospheric ozone.	Additional data/studies are required. Priority: n/a

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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11 (b) "constituting or that may constitute a danger to the environment on which human life depends on"
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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading Department	Paragraph 11(a)	11(b)	11(c)		
28	**Methyl Tertiary-Butyl Ether (MTBE)** Source: It is used in Canada as an octane enhancer in gasoline. It can enter the environment at any stage of production, storage, and transport of undiluted MTBE or MTBE-blended gasoline.	Environment	NT	NT	NT	Human populations. Based on available data, it was concluded that this substance is non "toxic" to humans. Wildlife/other populations. Found non "toxic" to wildlife populations and other animal populations. MTBE is not associated with the depletion of the stratospheric ozone or with global warming, and is not expected to contribute significantly to the formation of ground-level ozone.	Given the total absence of data on environmental concentrations, additional data/studies are required. Priority: High, medium and low.
29	**Methylmethacrylate (MMA)** MMA has short persistence in the atmosphere and its concentrations are predicted to be low. It is imported into Canada. Source: It is used in the manufacturing cast acrylic sheet, acrylic emulsions, and moulding and extrusion resins. Although data on concentrations are not available, concentrations of MMA in various media to which humans and other organisms may be exposed have been predicted on the basis of modelling.	Environment	NT	NT	NT	Human populations. Based on predicted concentrations and bioassays in animal species, the Tolerable Daily Intake (TDI) derived is not harmful to human life or health. Wildlife/other populations. It is estimated that the predicted concentrations of this substance have not adverse effects on wildlife population.	The Minister of the Environment and the Minister of National Health and Welfare do not intend that this substance be added to the List of Toxic Substances in Schedule I of the CEPA, therefore, will not be recommending that regulations be developed for this substance. Priority: n/a

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
30	**Mineral Fibres (MF)** Most MF are relatively stable and are expected to persist in the ambient environment. Glass wools, rock and slag wools, continuous glass filament and refractory ceramic fibres are the mineral fibres that are produced in Canada. Source: Glass wools, rock and slag wools are used mainly for thermal and acoustic insulation, continuous glass filament to reinforce plastics, and refractory ceramic fibres for high-temperature furnace and kiln insulation. Releases of MF are poorly quantified, but those that enter the Canadian environment, most are likely emitted into the air. No data were identified on concentrations in Canadian air, water sediment, or soil, although the information is available from other countries.	Health	UTA	NT	NT in 4 forms T in 1 form	Human populations. On the basis of the observed excess in respiratory and lung cancer observed in the production of rock/slag wool in epidemiological studies conducted to date, rock/slag wool has been classified as "possibly carcinogenic to humans". Due to the lack of adequate epidemiological studies on the carcinogenicity of rock/slag, glass wool,glass microfibres, continuous glass filament. It was concluded that these mineral fibres were not entering the environment in quantities that may represent a danger to human life or health. Only refractory ceramic fabric was not only found "probably carcinogenic to humans" but also was found that entered the environment in quantities that represented a danger to human life or health (based on studies that determined an increased incidence of pulmonary tumours in rats. Wildlife/other populations. Found non "toxic" to wildlife populations. Exposure of laboratory animals to these substances resulted in cancerous tumours in rats and mice. MF are not associated with the depletion of the stratospheric ozone or with global warming, and is not expected to contribute significantly to the formation of ground-level ozone.	Additional data/studies are required. Priority: n/a

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading Department	Paragraph 11(a)	11(b)	11(c)		
31	**Nickel and its Compounds** Nickel occurs at low concentrations in the atmosphere. The assessment focuses on the forms of nickel most likely to be found in the environment (i.e, several forms of inorganic nickel). Nickel is a natural occurring element which is ubiquitous in the environment principally in the divalents state. It is produced in Canada, most of which is sold abroad. Food is likely the most significant source of human exposure in Canada. Source: Nickel and its alloys are used in a wide variety of industrial applications for the automobile, shipbuilding, electrical, oil, food, and chemical industries. Nickel enters the Canadian freshwater and terrestrial (soil) environment as a result of natural weathering erosion of geological materials (e.g. glacial overburden and bedrock). Nickel is also release into the Canadian environment as a result of human activities including mining, smelting, refining, alloy processing, scrap metal reprocessing, other metal operations, fuel combustion and waste incineration.	Environment	T	NT	T in 3 forms NT in I form	Human populations. Based on evidence of carcinogenicity in occupational exposed human populations to each of the groups "oxidic", "sulphitic", and "soluble" nickel compounds has been classified as carcinogenic to humans. Available data were inadequate to address individual compounds within these groups. Available data also indicated that "soluble" nickel compounds induce contact dermatitis. Wildlife/other populations. Found "toxic" to the environment. Nickel and its compounds are not associated with the depletion of the stratospheric ozone or with global warming, and is not expected to contribute significantly to the formation of ground-level ozone.	(Gazette summary does not include recommendations of the assessment report, this report is not yet available). Priority: n/a

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading Department	Paragraph 11(a)	11(b)	11(c)		
32	**Non-Pesticidal Organotin Compounds (NPOC)** NPOC have been detected in water and sediment at several locations in Canada. mono-and di- methylene, butylin, and octylin compounds are imported into Canada. Source: They are mainly used as PVC stabilizers and also used as industrial catalysts. Based on limited fate information, they are expected to exist predominantly in the aquatic environment. The sources of these compounds to the environment are uncertain	Environment	NT	NT	UTA	Human populations. Available data are insufficient to serve as a basis for estimation of the exposure of the general population to any NPOC. Wildlife/other populations. Based on available data, NPOC are unlikely to cause adverse effects to aquatic biota. NPOC are not associated with the depletion of the stratospheric ozone or with global warming, and are not expected to contribute significantly to the formation of ground-level ozone.	It is recommended that additional data/studies be generated. Priority: High and medium. **This substance was identified in the Board of Review request list.**

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
33	**Pentachlorobenzene** This substance has been detected in samples of air, surface water, rain, sediment and biota collected at various locations in Canada. It is removed from air and surface water by degradation processes, such as photo-oxidation and biodegradation, but can persist and accumulate under anaerobic conditions in buried sediment and soils. This substance is not produced in Canada and currently there is no domestic commercial demand for this substance. Source: The two most significant sources of entry of this substance into the Canadian environment result from the spillage of dielectric fluids and from long-range transport and deposition.	Health	UTA	NT	NT	Human populations. Based in the estimated tolerable daily intake of this substance, it has been concluded that pentachlorobenzene does not enter the environment in quantities that may constitute a danger to human life or health. Wildlife/other populations. Although significant exposure of benthic organisms to this substance may be occurring in specific ecosystems in Canada, adequate data on the toxicological effects on these organism were not identified. Therefore, it is not possible to determine whether concentrations of this substance in sediments could result in harmful effects to these biota. Currently, the rates of release of this substance to the environment are low. It is not associated with the depletion of the stratospheric ozone or with global warming, and is not expected to contribute significantly to the formation of ground-level ozone.	To enable assessment of the environmental effects of this substance, it is recommended that additional data/studies be generated. In addition, to permit a more complete assessment of the exposure of the general population in Canada to this substance, additional monitoring data are desirable. Priority: High **This substance was identified in the Board of Review request list.**

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
34	**Polychlorinated Dibenzodioxins** They are highly persistent compounds with a strong affinity for sediments and of a high potential for accumulating in biological tissues. They have been found in all compartments of the ecosystem, including air, water, soil, sediments, animals and food. All animals and human in Canada are exposed to these substances. Source: The wood preservative pentachlorophenol, municipal incinerators, and pulp and paper mills using chlorine for the bleaching process are the most significant "toxic" dioxin sources. They enter the environment as complex mixtures from four major sources: commercial chemicals (e.g. pentachlorophenol); incineration; pulp and paper mills that use chlorine bleaching; and both accidental fires.	Environment	T	NAC	T	Human populations. These substances are retained by animals and humans, and they concentrate selectively in body fat and fatty organs such as the liver. Although dioxins can be metabolized and excreted, there is a relatively slow process in humans, with half-lives of several years reported for some dioxin. Studies in human populations indicate that exposure to several milligrams of mixtures of dioxins can lead to a variety of effects on skin, eyes, and sensory and behavioural processes. To date, there has been no clear demonstration that human populations exposed to dioxins have suffered excess cancer. Wildlife/other populations. It is extremely toxic to mammals, birds are even more sensitive than most mammals to short-term exposures of dioxins. Longer-term exposure of test mammals to lesser amounts can affect reproduction, cause birth defects, damage the liver and suppress the immune system. Exposure to dioxin at certain doses causes cancer in rodents. The ecosystem has clearly been affected in several well documented cases. Deaths of animals were noted after accidental exposures at Seveso, Italy and in Missouri, USA. Adverse effects on reproduction of fish-eating birds have been linked to	n/a Priority: n/a

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL 1)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
35	**Polychlorinated Dibenzofurans** They are highly persistent compounds with a strong affinity for sediments and of a high potential for accumulating in biological tissues. They have been found in all compartments of the ecosystem, including air, water, soil, sediments, animals and food. All animals and human in Canada are exposed to these substances. Source: Polychlorinated biphenyls (PCBs) are the most significant sources of "toxic" furans. They enter the environment as complex mixtures from four major sources: commercial chemicals; incineration; pulp and paper mills that use chlorine bleaching; and both accidental fires and spills involving polychlorinated biphenyls (PCBs, which contain principally furan contaminants).	Environment	T	NAC	T	Human populations. These substances are retained by animals and humans, and they concentrate selectively in body fat and fatty organs such as the liver. Exposure of women to several milligrams of furans in contaminated rice oil in Japan and Taiwan may have been responsible for reproductive anomalies and infant mortality. To date, there has been no clear demonstration that human populations exposed to furans have suffered excess cancer. Wildlife/other populations. It is extremely toxic to mammals. The ecosystem has clearly been affected in several well documented cases. Deaths of animals were noted after accidental exposures at Seveso, Italy and in Missouri, USA. Adverse effects on reproduction of fish-eating birds have been linked to high ambient exposure in the Great Lakes and on Canada's West Coast. Malformed embryos and reproductive failure have been observed in fish-eating birds in the Great Lakes. No assessment was conducted on the rates of release to the environment.	n/a Priority: n/a

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
36	**Polycyclic Aromatic Hydrocarbons (PAHs)** PAHs are relatively non-volatile and of low solubility in water. PAHs in sediments degraded slowly, this medium is the major environmental sink of PAHs. Source: PAHs are emitted into the Canadian environment from both natural and anthropogenic sources. Forest fires are the single most important natural source of PAHs in Canada. The largest anthropogenic sources are aluminium smelters. Major sources of PAHs to the aquatic and soil environments include creosote-treated products, spills of petroleum products, metallurgical and coking plants and deposition of atmospheric PAHs.	Environment	T	NT	T in 5 forms	Human populations. Based on the results of carcinogenicity bioassays in which PAHs have been administered to experimental animals by inhalation and dermal application and supporting data, five PAHs were classified as "probably carcinogenic to humans" (i.e., substances for which there is believed to be some chance of adverse effects at any level of exposure). Wildlife/other populations. Aquatic organisms have been adversely affected by contamination of PAHs. Moreover, PAHs in sediments of Hamilton Harbour, Ontario, have been associated with mortality of sensitive aquatic invertebrates under laboratory conditions. PAHs are not expected to contribute significantly to global warming or depletion of stratospheric ozone.	(Gazette summary does not include recommendations of the assessment report, this report is not yet available). n/a Priority: n/a

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading Department	Paragraph 11(a)	11(b)	11(c)		
37	**Styrene** Although it does not persist in the environmental media, measurable concentrations have been reported in ambient air, indoor air and water in Canada, and in some industrial and municipal effluents. It is produced in Canada. Source: It is used domestically in the production of a number of polymers and resins and is released into the Canadian environment, principally into the atmosphere.	Health	UTA	NT	NT	Human populations. The tolerable daily intake in the general population has been estimated to be the intake that a person can be exposed daily over a lifetime without deleterious effect. Wildlife/other populations. Adequate data on the toxicological effects on wildlife populations were not identified. These substances are present in low concentrations in the environment and are not expected to contribute significantly to global warming or depletion of stratospheric ozone.	Additional data/studies are recommended to enable an assessment of the environmental effects of this substance. Also, additional data is desirable to permit a more complete assessment of the exposure of the general population. Priority: High and medium. **This substance was identified in the Board of Review request list.**

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
38	**Tetrachlorobenzenes** Currently, the rates of release of this substances into the environment are low. They are not persistent in air or surface water, but can persist under anaerobic conditions in buried soil or sediment. These substances are produced in Canada. Source: On the basis of limited data, the two most significant sources of entry into the Canadian environment are from spillage of dielectric fluids and long-range transport and deposition. They have been detected in samples of air, surface water, rain, sediment and biota collected at various locations in Canada.	Health	UTA	NT	NT	Human populations. The tolerable daily intake in the general population has been estimated to be the intake that a person can be exposed daily over a lifetime without deleterious effect. Wildlife/other populations. Adequate data on the toxicological effects on wildlife populations were not identified. These substances are present in low concentrations in the environment and are not expected to contribute significantly to global warming or depletion of stratospheric ozone.	Additional data/studies are recommended to enable an assessment of the environmental effects of this substance. Also, additional data is desirable to permit a more complete assessment of the exposure of the general population. Priority: High and moderate. **This substance was identified in the Board of Review request list.**

Paragraph 11 (a), (b) and (c) of the CEPA reads:
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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading Department	Paragraph 11(a)	11(b)	11(c)		
39	**Tetrachloroethylene** Concentrations of this substance has been detected in outdoor and indoor air, surface and groundwater (the Great Lakes and St. Lawrence River regions), drinking water, sediment, and biota in various regions of Canada. It is not longer produced in Canada but continues to be imported. Source: It is primarily used as a solvent in the dry-cleaning and metal-cleaning industries. It is also used in smaller quantities in the finishing and processing of textiles, the manufacture of paint removers and printing inks, the formulation of adhesives and specialized cleaning fluids, and as aerosols and dye carriers. It is also present in household products, including automobile cleaners, suede protectors, paint removers and strippers, water repellents, silicone lubricants, belt lubricants and dressings, specialized aerosol cleaners, ignition wire driers, fabric finishes, spot removers, adhesives and wood cleaners. Its presence in groundwaters in several provinces, is often as a result of its inappropriate disposal or release from dry-cleaning facilities or landfills.	Health	T	NT	NT	Human populations. Classified as "possibly carcinogenic to humans". Although increased mortality and morbidity due to various types of cancer have been observed in workers employed in the dry-cleaning and laundry industries, owing to the lack of consistency of reported results and to possible confounding by concomitant exposure to other substances that may have contributed to the observed effects, the available information is considered inadequate to assess the carcinogenicity of this substance in humans. Based on TDI, this substance was found non "toxic" to human life or health. Wildlife/other populations. Brook trout and rainbow trout have been identified to be among aquatic species most sensitive to the effects of acute and chronic exposure to tetrachloroethylene. It also found to have adverse effects on forests. Although not statistically significant, an increase of renal tubular cell adenomas and adenocarcinomas in male rats, mononuclear cell leukaemias, hepatocellular adenomas and carcinomas in mice exposed by inhalation to this substance, have been observed in an carcinogenesis bioassay. This substance is present in low concentrations and has short half-life in the atmosphere. As such it is not expected to contribute	Recommendations for further research of tetrachloroethylene included: Additional data/studies on the extent of contamination of Canadian groundwater; investigations in the inducement of tumours on laboratory animals and their relevance to humans; the effects on terrestrial plants; sediments and soil bioassays; toxicity tests on wildlife species; and to continue monitoring the exposure of the Canadian population to this substance. Priority: n/a

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Priority Substances List Assessment Reports Summary

No.	Name and Source of Substance (PSL I)	PSL Assessment of toxicity under Section 11 of the CEPA				Nature of Health Risk and Population Potentially at Risk	Recommendations for Research and Evaluation
		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
40	**Toluene** Toluene does not persist in water or soil because it biodegrade and volatilizes rapidly to the atmosphere. It does not persist in the atmosphere because it undergoes rapid photo-oxidation. Because toluene volatilizes from gasoline, the highest ambient concentrations have been recorded in the immediate vicinity of gasoline marketing stations. Source: The dominant end-use for isolated toluene in Canada is in the production of benzene. Toluene is used as a solvent in paints and varnishes, pesticide formulations, printing inks, adhesive and sealants, cleaning agents, and for chemical extractions. It is a natural component of coal and petroleum. It may be introduced into the environment through petroleum seepage and weathering of exposed coal-containing strata and into ground water from petroliferous rocks. Toluene is also produced by incomplete combustion of natural fuel materials, and as such is released during forest fires.	Health	NT	NT	NT	Human populations. Classified as "probably not carcinogenic to man". Decrease in neurological function as a measured by a variety of tests, an increase in neurological symptoms and irritation of the respiratory tract following exposure to toluene have been reported in clinical studies. Wildlife/other populations. The acute toxicity of toluene is relatively low. Repeated short-term exposure of animal species to moderate to high concentrations of toluene causes central nervous system depression and adverse effects on the liver, kidney and lungs. There has been no evidence of carcinogenicity or chronic toxicity of toluene in animal species. The most sensitive of aquatic biota are rainbow trout and coho salmon. Because of its short persistence in the atmosphere and failure to absorb ultraviolet radiation, toluene is not associated with depletion of stratospheric ozone or with global warming.	Additional data on concentration of toluene, its interaction with other substances, studies of the effects of chronic exposure would be required to permit a more complete assessment of this substance. Priority: Low

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		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
41	**Trichlorobenzene** This substance has been detected frequently in samples of Canadian surface water, sediment and biota collected in the Great Lakes region. It is imported into Canada. Source: It enters soil (primarily as a result of spills of dielectric fluids) and water from discharges of industrial effluents and landfill leachates. Emissions to air result from volatilization following industrial use of this substance as solvents, and from incomplete incineration. There is also evidence that it may be produced by biodegradation of more highly chlorinated benzenes in anaerobic sediments and by metabolism of the fungicide lindane in roots of treated wheat seedlings. It is used as solvents in the textile manufacturing and the production of other chemicals. In the past there were used in combination with PCBs in dielectric fluids for transformers and capacitors. This use, however, has decreased considerable after regulations prohibiting the use of PCBs were introduced.	Health	UTA	NT	NT	Human populations. Available information is considered insufficient to assess exposure of the general population. Wildlife/other populations. Because of lack of information is not possible to determine the adverse effects of this substance on soil-dwelling organisms in Canada. Based on available data, it was found that this substance may not constitute a danger to the environment on which human life depends.	Several data gaps were identified that limited the assessment of this substance, further studies including toxicity tests and data on soil concentrations would be required to permit a more complete study. Priority: High **This substance was identified in the Board of Review request list.**

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		Leading Department	Paragraph 11(a)	11(b)	11(c)		
42	**Trichloroethylene** Concentration of this substance have been detected in all environmental media in Canada. It is imported into Canada. Source: Indoor air is the major source of exposure to trichloroethylene in the general population, while ambient air, drinking water and food make only minor contributions. Entry in the environment include discharges from dry-cleaning operations, sewage treatment plants, textile mills and other industries, releases from landfills, incinerators, septic tanks and storage tanks. It is primarily used as a cleaning and degreasing solvent in metal-cleaning in the automotive and metal industries. It is also used in the production of adhesive and copolymers, household and industrial dry-cleaning, textile manufacturing, the cleaning of electronic components, petroleum industry processes involving refining catalysts, paint removers coatings and vinyl resins, and in laboratory reagents/solvent applications. Household or consumer products that may contain this substance include typewriter correction fluids, paint removers/strippers, adhesives, spot removers and rug-cleaning fluids.	Health	T	NT	T	Human populations. Classified as "probably carcinogenic to humans". Although some excesses in mortality due to different types of cancer have been observed in some epidemiological studies of populations occupationally exposed to this substance, there has been no consistent convincing pattern. Wildlife/other populations. Tumours to the liver and lung and hepatocellular tumours in mice and testicular tumours in rats are associated with exposure to this substance. It also has adverse effects on some aquatic species but it is not anticipated to cause effects on mammalian wildlife. No data are available to evaluate effects on birds. There is limited data to suggest that this substance may be sufficient to cause adverse effects on terrestrial plants. On the basis of available data, this substance is not thought to contribute to the depletion of stratospheric ozone, or the formation of the ground-level ozone or global climate change.	Nine recommendations required that additional data be obtained to enable a more complete evaluation of the potential effects to the health of the general population in Canada. Also in assessing the entry, exposure, and effects of this substance on the environment. Priority: n/a

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		Leading Department	Paragraph 11(a)	11(b)	11(c)		
43	**Waste Crankcase Oils (WCO)** The re-fining, burning as fuel, road-oiling for dust suppression and land disposal of the WCOs are of concern in the Canadian Environment. Source: This substance is defined as used in lubricating oils removed from the crankcase of internal combustion engines. WCOs and their constituents may be released to air, water, and soil. Burning of WCOs leads to air emissions of metals and polycyclic aromatic hydrocarbons (PAHs) (the constituents of WCOs of most concern) that are absorbed to particulate matter and deposited to soil and water.	Environment	UTA	NAC	NAC	Source:Human populations. There is insufficient information to estimate the exposure of humans to WCOs.. Wildlife/other populations. Insufficient information was available to estimate exposure of aquatic and terrestrial biota to WCOs.	The available information was not sufficient to reach a conclusion for WCO. Four recommendations required field toxicity testing be conducted. Priority: High **This substance was identified in the Board of Review request list.**

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		Leading	Paragraph				
		Department	11(a)	11(b)	11(c)		
44	**Xylenes** Xylenes are produced in and imported into Canada. Xylenes do not persist in water or soil because of their high volatility and their biodegradation, nor do they persist in the atmosphere because of their rapid photo-oxidation. Concentrations of Xylenes can be higher in indoor air than in ambient air because of the following: the presence of house hold products, including solvents for cleaning and paint stripping; building materials; and personal activities such as smoking. Source: Most xylenes are produced by the catalytic reforming of petroleum as by-products of the cracking of crude and heavy oil. Xylenes are released into the air principally from their use as solvents and from transportation sources, and into soil and water through spills and leakage of petroleum and other chemical products. These releases have resulted in the presence of measurable concentration of xylenes in air, water, and soil in Canada although xylenes do not persists in any of these media.	Health	NT	NT	NT	Human populations. Xylenes are classified as "probably not carcinogenic to humans". Available data on concentrations of xylenes in foodstuffs were insufficient to estimate the general population intake (smokers who smoke 20 cigarettes per day may increase their total intake of xylenes). Available epidemiological data are also inadequate to assess the health risks (including carcinogenicity) of xylenes to humans. Wildlife/other populations. Xylenes were found not carcinogenic following oral administration to rats and mice in a well-conducted bioassay. Studies have found that inhalation of xylenes induce adverse effects in animal species, such as implantational loss and decreased placental weight, and retardation in skeletal development of offspring in the absence of maternal toxicity. There are insufficient data available to assess wildlife exposure in the aquatic environment or potential effects of xylenes on birds in terrestrial or aquatic environments. Xylenes do not contribute directly to global warming because of their short resistance time in the troposphere, their low atmospheric concentrations relative to known greenhouse gases, and their low absorption of radiation.	Seven recommendations required for xylene's additional data on indoor air, foodstuffs, contamination of ground water, developmental effects and individual isomers, pharmacokinetic methods, chronic exposure studies, effects on aquatic biota. Priority: Low

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